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No. 23

DEATH OF HENRY G. MORSE

Death came very suddenly on Tuesday to Mr. Henry G. Morse, president of the New York Ship Building Co., Camden, N. J. He was stricken with apoplexy in the private office of J. P. Morgan & Co. in New York and died an hour later at the Astor house, to which he had been removed in a private ambulance. The rushing of an ambulance to this great financial center created the wildest excitement in Wall street, which was added to by the fact that J. P. Morgan & Co. refused to give out any information whatever regarding the occurrence.

Mr. Morse had the honor of presiding over what is undoubtedly the most expensive ship building plant in the United States and one of the finest in the world. He was literally the founder of it, securing the necessary capital and deciding upon the site in January, 1899. Work was im-

mediately prosecuted with the utmost vigor and there came into being the only ship yard in the United States where a large modern vessel, even a battleship, may be built entirely under cover.

Mr. Morse was about fifty-five years old and was a native of Ohio. His technical education was obtained at the Rensselaer Polytechnic Institute, Troy, N. Y., from which he graduated in 1871. Immediately thereafter he entered the service of the Pennsylvania railroad under John A. Wilson, and was employed in construction work, having direct charge of the Long Point tunnel. In 1872-73 he was engineer and superintendent in charge of construction of the masonry and erection of two bridges over the Allegheny, at Foxbury and Parker's Landing. From 1873 to 1878 he was engineer for the Wrought Iron Bridge Co. of Canton. Then for nine years he was a partner in the Morse Bridge Co. of Youngstown, O. For another period of nine years he was president of the Edgemore Bridge Works at Wilmington, Del., and then he was introduced to ship building, being president of the Harlan & Hollingsworth Co., Wilmington, Del., from 1896 to 1898. Then he devoted his long experience to the plans of the New York Ship Building Co., designing the plant, examining sites and obtaining subscriptions to the stock of the company.

THE TWO BIG CUNARD LINERS.

At the last meeting of the directors of the Cunard Steamship Co., it was decided to proceed with the construction of the two steamships, which, it is hoped, will once more bring back to the British flag the credit of possessing the largest, finest and fastest steamships afloat. The directors, it is said, also resolved to place the contracts, one on the Clyde and the other on the northeast coast. The liners are to be built under certain terms entered into with the government, which provide that the Cunard company shall, during the term of the agreement, remain a purely British undertaking—British as to shareholders, ships, board, officers and employes and British as to management and control in every respect. The two great liners, together with the rest of the fleet, are to be held at the disposal of the government during the currency of the agreement; and, in return for this, the government is to lend to the company the money for the construction of the two new vessels at 2½ per cent per annum, and it is also to pay the company from the time these new ships begin to run £150,000 per annum. As the chairman, Lord Inverclyde, remarked at the annual meeting of shareholders a few weeks ago, these steamships will, of their kind, be the biggest thing which has yet been done in the world, and, he trusted, would not only give satisfactory results to the shareholders but would be such ships as both the company and the country would be proud to own.

It has been stated that the great liners are to have a minimum speed of 25 knots from port to port and will cost £1,500,000 each, the time required for construction being put down at two years. Assuming that 25 knots is the speed required and that the vessels are designed with the same block coefficient as the *Campania* and *Lucania*, the new craft will have a displacement of nearly 32,000 tons, or 6,000 tons more than the *Kaiser Wilhelm II*, while 750 ft. in length and other dimensions in proportion

will be required for their flotation. It has also been estimated that the driving power will have to be 65,000 H. P., and the furnaces will number no fewer than 144, needing 400 firemen. Ship building experts who have had the question of construction under consideration, according to remarks made from time to time, have every confidence that the new liners will prove a complete success and fulfill every anticipation regarding them.

OUR TRADE WITH RUSSIA.

The alarms which have been sounded during the past two years regarding the trade relations between the United States and certain other countries of the world find no justification in the figures of our commerce up to this time. The three countries which have been mentioned from time to time as likely to decrease their importations from the United States are Russia, Austria-Hungary and Germany. A study of the latest figures of the treasury bureau of statistics regarding our imports and exports shows a steady growth in trade relations with all these countries and indicates that our commerce with each of them is likely to be larger in the present fiscal year than in any previous year in the history of our commerce. This is true both of the imports and exports. To each of these three countries our exports are steadily and rapidly increasing, and from each of them our imports are also steadily and rapidly increasing. This is especially marked in the figures of our trade relations with Russia in the present fiscal year. The latest figures of the bureau of statistics are for the nine months ending with March. They show that our exports to Russia in that period were nearly double those of the corresponding period in any year of the last decade and that our imports from Russia are also steadily and rapidly increasing, being double those of 1899 and three times those of 1894. In both imports and exports the figures of our trade with Russia in the nine months ending with March are about three times as large as in the same months of 1894. In exports the increase has been especially marked in the past year, our total exports in the nine months ending with March, 1903, being \$13,584,875, against \$7,441,014 in the same months of last year. In imports from Russia the figures of the present year also show a marked increase over last year, and it is quite apparent that our imports from Russia in the present fiscal year will be the largest in the history of our commerce with that country. Our principal imports from Russia are hides and skins, wool, licorice root, and fibers; and for all of these there is a constantly increasing demand among manufacturers. Our principal exports to Russia are cotton, of which the United States produces three-fourths of the world's supply; copper, of which we produce one-half of the world's supply; agricultural implements and machinery.

CONSOLIDATED LAKE SUPERIOR CO.

Cornelius Shields, president of the Consolidated Lake Superior Co., has made the following statement regarding the affairs of the company at the Sault:

"In the manufacture of steel rails at the Sault, which will be started, as I expected, right at the beginning of July, we will this year use 80 per cent of ore from the Mesabi district and 20 per cent of the ore from the Helen mine. This mixture of ore will enable us to turn out a rail equal to any manufactured any place in the world. Two of the blowing furnaces are now completed, and the machinery for two others is already on the ground, ready to be installed. By next year we will have made arrangements to secure from our properties in Minnesota ore that is practically a duplicate of that to be found in the Vermillion range. This will enable us to dispose of an increased quantity of the ore from the Helen mine, for which there is a strong demand throughout the United States. This year we will dispose of close to 500,000 tons to different manufacturers, shipping it even as far as Virginia. The demand has been so great that we have even been obliged to refuse orders. The Helen ore is of a peculiar nature and has been found very valuable when mixed with other ores for the manufacture of a specially high grade of steel, and on this account a good price is being secured for it. Needless to say, I am greatly pleased with the progress that has been made since I took charge. A number of changes are yet to be made and we expect that they will all be beneficial to the company."

Mr. Shields added that the further he looked into the possibilities of the enterprises the more was he convinced of their success.

Rear Admiral Francis T. Bowles, chief of the bureau of construction and repair, navy department, has drawn five separate plans for the two 13,000-ton battleships authorized by congress. This type of vessel is not regarded with favor by the navy department, as the prevailing tendency is to make them larger, but an endeavor will be made to make them the most powerful for their size afloat.

COMMERCE OF DETROIT RIVER.

In its issue of May 14 the Review endeavored to analyze the report of Major W. H. Bixby, government engineer at Detroit, as to the amount of freight carried on the Detroit river and through the St. Clair flats canal. Major Bixby gave the freight carried in 1902 as 44,260,506 net tons. As the freight carried to and from Lake Superior alone in that year was 36,000,000 net tons, the great bulk of which passed through the Detroit river, it was felt by the Review that Major Bixby's figures were too low, because there is a very large business transacted with the other lakes that is not measured by the Sault Ste. Marie statistics at all. Major Bixby did not reply directly to what was said in these columns of his Detroit river traffic report, but an article on the subject, evidently from him but without his signature, appeared in one of the Detroit papers. It is as follows:

"No exact statistics of commerce for the great lakes as a whole are at present possible at any reasonable cost because of various reasons easily understood by those acquainted with such commerce, its customs regulations, tonnage register and records, and the unequal distribution of the commerce between the various lake ports. The most accurate report so far known in case of a commerce of large capacities is that of the Sault Ste. Marie canals (also in charge of Major Bixby), whose statistics of commerce for the last year have also just been issued by him. At the Sault it has been possible to make every boat captain render a signed statement of the cargo carried by his boat before he is allowed to pass through the canal locks. Such reports cannot as yet be obtained in the Detroit river and St. Clair flats canal by reason of lack of a government force for such special work, and of the difficulty of securing individual reports from every boat captain.

The report above referred to for St. Clair flats canal and Detroit river for the calendar year 1902 is based, however, on the tonnage and freight of all boats reported by the Detroit marine postoffice, whose list is believed to be complete, and while the report does not include the railroad and foot and carriage ferry travel between Detroit and Windsor as well as between different parts of Detroit, yet, on the other hand, it does include all other local commerce and travel (freight and passenger, both ordinary and excursions) between different parts of the Detroit and St. Clair rivers from below Amherstburg up to Port Huron, inclusive.

Major Bixby's office has in its possession all the accurate information obtainable from the Sault canal (which is a part of his office) and from the Detroit marine postoffice and the American and Canadian customs offices along the Detroit river; and he has every reason to believe that the net registered tonnage of the Detroit and St. Clair rivers as above reported is therefore quite accurate and trustworthy, and much more so than anything heretofore published for five or six years.

The question of the actual freight carried by vessels on the great lakes is not one of easy and exact determination under even the most favorable circumstances. Vessels load often far in excess of their net registered tonnage as well as often far below it; and freight statements are not always to be depended on for exactness. Recent careful statistics at the Sault for several years past show that the freight carried by the average great lakes vessels, as reported by boat captains, at present averages only about one-eighth more than the net registered tonnage.

Major Bixby has seen a good many statements in various marine papers which would seem to claim a larger tonnage through the Detroit river than that at present reported by his office; but such statements are not those of officials charged by law with their collection and compilation and have not been accompanied by any definite careful statements sufficient for use for official compilation; and until such definite information is placed at his disposal, his office feels obliged in its official publi-

cations to consider its just published results of a little over 37,000,000 net registered tons, and a little under 42,000,000 tons (2,000 lbs. each) of actual freight, although approximate, to be more accurate than any other estimates of the past three or four years so far brought to his notice."

The foregoing statement does not in any way controvert the argument set forth in the Review. Not a single fact is adduced to show that the Review's reasoning is incorrect. Nor is there anything to prove that Major Bixby's figures are correct. Of course "the question of actual freight carried by vessels on the great lakes is not one of easy and exact determination," and it is not the intention of the Review to enter complaint because Major Bixby or other engineers in charge of government works do not undertake this task, but if figures are given out, especially by agents of the government, they should not be approximate figures, they should be exact. In this connection it may not be amiss to note that the law requires the engineers to collect just such statistics as are here referred to and confers the necessary power to have these statistics correct. On Feb. 28, 1891, the following circular was issued by the war department to the corps of engineers:

"The following act of congress, approved Feb. 21, 1891, is published for the information and guidance of officers of the corps of engineers and agents of the engineer's department:

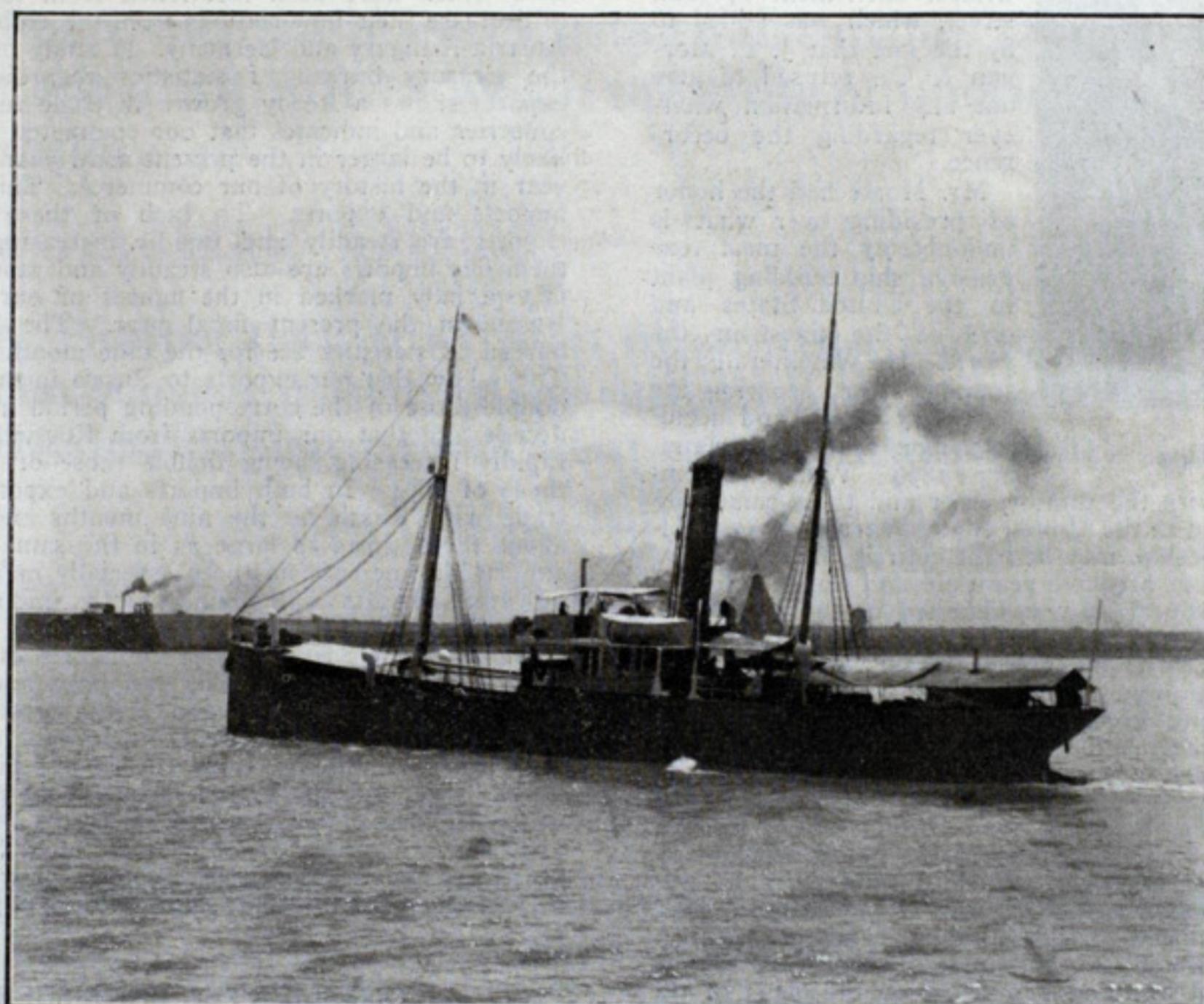
"Be it enacted by the senate and house of representatives of the United States of America in congress assembled that owners, agents, masters and clerks of vessels arriving at or departing from localities where works of river and harbor improvements are carried on shall furnish, on application of the person in local charge of the works, a comprehensive statement of vessels, passengers, freight and tonnage.

"Sec. 2. That every person or persons offending against the provisions of this act shall, for each and every offense, be liable to a fine of \$100 or imprisonment not exceeding two months, to be enforced in any district court in

the United States within whose territorial jurisdiction such offense may have been committed."

This act was intended to enable the engineer to collect statistics. It clothes him with sufficient authority to arrest all vessel men who decline to furnish him with a statement of the ship's cargo. This act is as much in force now as it was the day the circular was issued. Every engineer on the lakes is familiar with it. Major Bixby has sufficient authority to get a manifest of registered tonnage and cargo from every vessel passing along the Detroit river and through the St. Clair flats canal. He can put into jail every master of a vessel who declines to give him such a manifest. Under these circumstances it would certainly seem that if figures regarding Detroit river traffic are to be issued in the name of the United States they should not be estimates or approximate figures. It will be admitted, all the time, of course, that it is no easy task to secure these figures, but let it be repeated that it would be far better to have no report at all than to have one that might be criticized as being probably several million tons out of the way.

Major Dan C. Kingman, now in charge of the Cleveland district, was in charge of the Oswego district when this provision was inserted in the river and harbor bill. He prepared blanks and set about complying with the law absolutely. So well did he get along that the collectors of customs desired copies of the reports, and in order to facilitate matters agreed to board the vessels for him. Envelopes were furnished to the masters in order to mail the reports back in case they could not be filled out accurately as the vessel was clearing. In this manner the commerce of the Oswego district was reliably kept for three or four years. Of course the work of collecting such statistics in the Oswego district is not to be compared with similar work on the



TYPE OF STEAMER IN THE CENTRAL AMERICAN FRUIT TRADE.

The Steamer Esther of the Bluefields Navigation Co., operating between New Orleans and Bluefields, Nicaragua.

Detroit river, or even at such places as Cleveland, Buffalo or Chicago, and in view of the difficulties encountered at these places of great traffic it is not the purpose of this article to enter complaint because correct reports of commerce are not compiled by the engineers, but to emphasize the necessity of having such reports right when they are given to the public through officers of the government.

TO AMEND STEAMBOAT INSPECTION CODE.

A special meeting of the board of supervising inspectors of steam vessels is being held in Washington this week. The board is to undertake a thorough revision of the rules and regulations of the service. While this board at its annual meetings amends the rules more or less each year the purpose of this special meeting is to recast the entire code. Such great advances have been made in boiler construction, in life saving appliances and in other things that the present code is regarded as antiquated, especially from an engineering standpoint. A very important feature of the work of the board will be the consideration of regulations concerning the manufacture, installation and inspection of boilers with special reference to the representations made to congress last winter by the American Boiler Manufacturers' Association. This association secured the introduction of a bill in both branches of congress at the last session authorizing the appointment of a special commission to revise "all laws of the United States relating to the construction, installation and inspection of marine boilers and their appurtenances, and to suggest the enactment of such additional legislation as will effect improvement in the construction of marine boilers and maintain uniformity of inspection of marine boilers in all portions of the United States and insular possessions, and to further provide a reciprocal recognition of boiler inspection certificates between the several maritime nations having marine inspection laws." It will be remembered that this bill failed of passage in the rush of the closing hours of congress and that it was afterward that much of what is desired in the way of changes in the steamboat laws may be had through authority of the supervising inspectors and the secretary of the treasury without act of congress. The principal changes desired are as stated to the senate committee :

"The uniformity in the rules should be so complete that a boiler builder in one part of the United States may build boilers for delivery to a vessel in another part, and our standards should be, so far as possible, made to agree with those of the foremost European countries, so that the boilers of a vessel of one nation may be repaired and inspected in the ports of another without prejudice. The materials of construction should be specified and tested according to the most advanced modern standards of engineering, so that the best materials may be recognized at their full value. A precise, correct and uniform rule as to factors of safety should be embodied in the law. Not only is this not the case now, but certain of the provisions of the law in this respect are not and never have been complied with, and the law should be amended to recognize the practice which has grown up and is proved correct by the constantly increasing safety of our steamboat inspection service. Closely allied with these are questions of various kinds of riveted joints and the hydrostatic pressure used in accepted tests. Better riveted joints have been developed and their extra strength should be recognized in the law; and there is not only no necessity, but an element of danger in carrying the hydrostatic pressure test to such extreme as the law makes necessary. Finally an entire rearrangement of the sections of the law seems necessary. Thus questions of design should come first, next materials and their inspection, then tests and factors of safety, then methods of workmanship, and finally matters of location, connections and accessories, and all conflicting sections should be harmonized."

Of course some of the changes here outlined may be beyond the jurisdiction of the treasury department to put into effect but there is assurance that congress will authorize whatever the board agrees upon.

At this meeting the board will take up the old question of uniformity in steering steam vessels on the lakes. This is referred to in a short article elsewhere in this issue.

The meeting is being held in the Lemon building, back of the war department, in the same rooms which once witnessed the "canned beef investigation" at the close of the Spanish war. All of the inspectors are present with the single exception of Mr. John Birmingham of the San Francisco district. He is detained by the illness of his wife and is also excused by the law which permits the inspector of the San Francisco district to be absent from meetings of the general board once in two years. The board therefore consists of Inspector General George Uhler and the following inspectors: Robt. S. Rodie of the New York district; John W. Oast, Norfolk, Va.; Ralph J. Whittlesey, St. Louis; John D. Sloane, Dubuque, Ia.; Eugene L. Dorsey, Louisville, Ky.; Samuel R. Crumbaugh, Cincinnati, O.; Chas. H. Westcott, Detroit, Mich.; James Stone, Cleveland, O., and John A. Cotter, New Orleans, La., representing the districts from the second to the tenth respectively.

A great deal of interest has been manifested in various parts of the country in the meeting of the board. A number of prominent firms and individuals will be represented in person or will file written recommendations as to the changes that they would like to see incorporated in the revised rules of the service. Among those who have already notified the department of their intention

to be present or have submitted suggestions on the various subjects of the inquiry are the following:

A. C. Huston of the Lukens Iron & Steam Co. of Coatesville, Pa., which is the oldest manufacturer of boiler plates in the United States; the Worth Bros. of Coatesville, Pa., another of the largest makers of boiler plates in the country; W. S. Cahill, president of the Jas. Clark Co. of Baltimore; Frederick W. Kolb of the Tolchester Co. of Baltimore; E. D. Meier, president of the Heine Safety Boiler Co. of New York; and Chauncey G. Whiton, agent and treasurer of the New Bedford, Martha's Vineyard & Nantucket Steamboat Co.

PHILADELPHIA SHIPPING NOTES.

Philadelphia, June 3.—At the regular annual meeting of stockholders of the William Cramp & Sons Ship & Engine Building Co., a few days ago, the old officers of the company were re-elected, the recent changes in the organization of the company were approved and the new directors chosen recently at a special meeting were duly elected. The annual report was not made public. It is said to have shown net earnings of over \$600,000. The officers elected were as follows: Charles H. Cramp, president; Edwin S. Cramp, vice-president; Charles T. Taylor, secretary and treasurer; directors, William H. Barnes, a director of the Pennsylvania railroad; Henry A. Berwind of the Berwind-White Coal Co.; Edmund C. Converse of the United States Steel Corporation; Charles H. Cramp, Edwin S. Cramp, J. W. Dunn, president of the International Steam Pump Co.; Henry S. Groves, Philadelphia; S. L. Hine, president of the First National Bank of New Jersey; Francis L. Potts of the Empire Transportation Co.; William M. Potts of Philadelphia, Albert Strauss of J. & W. Seligman & Co., New York; executive committee, Henry S. Groves, E. C. Converse, W. H. Barnes, Albert Strauss and Francis L. Potts. As has been already noted a special meeting of the stockholders has been called for June 25 for the purpose of voting on an increase of capital and of the bonded indebtedness of the company. It is proposed to raise the capital from \$5,000,000 to \$6,250,000, and it is further proposed to enlarge the bond issue from \$1,800,000 to \$7,500,000.

Mr. Charles H. Cramp is disturbed over statements attributed to him in an address recently before one of the schools of the University of Pennsylvania. He was credited with the following: "In one respect the great Morgan ship combine rendered a good service to England, for it awakened that country from its lethargy, and England is now aware that the United States has outstripped her and she is doing her utmost to regain her former supremacy as mistress of the seas." This he denies and he also denies that he compared the "prosperous condition of ship building in the United States" with that of England and Germany. "These statements are absolutely and absurdly untrue," said Mr. Cramp. "I never made such assertions. I could not, because they are entirely false; such declarations would be ridiculous. I cannot make my denial too complete," he continued with great emphasis, "because if such statements are permitted to go unchallenged they are destined to work incalculable harm to American ship building and ship-owning interests. Such declarations coming from me would be quoted against the interests of the American merchant marine by its opponents on the floor of congress; they would be distinctly hurtful to the best interests of American ship builders, of whom I am one; but separate and apart from all that, they would make me appear ridiculously ignorant of the profession to which I have devoted the principal years of my life." The statements attributed to Mr. Cramp were so remarkable they were cabled abroad, where they attracted wide attention. Hence, his wish to place himself right.

The Maritime Exchange of Philadelphia is negotiating a lease of the abandoned lighthouse on the west end of the Delaware breakwater. They want the house as a reporting station from which incoming and outgoing vessels will be reported directly to the exchange headquarters in the Bourse building.

The first carload of material for the new United States cruiser Washington arrived at the works of the New York Ship Building Co. last Friday. No date has yet been set for beginning the work of putting down the keel of the new war vessel, but it is probable it will be laid some time in July. Two oil barges now building in the shed in which the cruiser is to be constructed must be launched before the work is begun.

At the yard of the Bethel Marine Co., Bethel, Del., a barge is being constructed which will carry 1,500 tons. The vessel is 225 ft. long. The company is also building a coastwise schooner of 550 tons. The steamboat Goldsborough, rebuilt at this yard for George F. Pierce of Milford, Del., will enter at once into freight service between Milford and Philadelphia.

The Pedrick & Ayer Co., manufacturers of machinists' tools, recently removed from Philadelphia to Plainfield, N. J., where it now occupies newly erected buildings as follows: Main shop, 100x400 ft.; boiler and engine house, 40x40 ft.; blacksmith shop, 40x50 ft.; pattern shop, 45x100 ft. A number of tools made by this company have been found almost indispensable in the various yards and shops of ship building firms and are popular with mechanics and workmen.

The power plant at League Island navy yard, for which bids are being received, will consist of the following machinery and equipment: Two continuous-current generators, one motor generating set, one switchboard and wiring, two vertical cross-compound engines, one cross-compound two-stage steam-driven air compressor, two air pumps and jet condensers, one tank pump, one horizontal boiler feed pump, four wrought-steel sectional boilers, one water-tube feed water heater, one hydraulic accumulator and pump, and one hand traveling crane.

SCOTCH SHIP BUILDING.

Labor Troubles settled for the present—Description of Largest Battleship afloat—Another Ship Building Combination.

Glasgow, May 24.—Trouble in the engineering trade may now be considered at an end—for the present. The men have resumed work—at least such of them as there were places for—at the reduced scale. It is understood, though no formal vote has yet been recorded, that both on the northeast coast and in the Clyde area, the men have agreed to accept the reduced scale for the next three months, and that on Aug. 1 the executive of the Amalgamated Society of Engineers will apply to the Employers' Federation for a restoration of the reduction, should the state of trade then warrant such a demand. The usual course is for a wage agreement to hold good for six months, but in this case the employers have been willing to limit the term to three months, both because that seemed something in the form of a concession to please the men, and because the term with the machinists will thus expire at the same time as the existing agreements with the "black squad" and the "white squad" expires. Thus, when the negotiations are resumed all the trade unions can be marshalled in line and treated with *en bloc*. The other unions have, of course, a grievance against the machinists for obtaining three months longer at the old rates than other workers had, and they will probably use all their weight to prevent the Amalgamated Society of Engineers from snatching any further advantage at next settlement. That by Aug. 1 there will be such an improvement in the ship building trade as to warrant a return of the 5 per cent now taken off wages is extremely improbable. Ship builders are booking few new contracts and the summer is usually the dull season in the trade. It is true that the engine shops are pretty well employed just now in disposing of current work, but the ship yards have not much to look forward to. The only thing that is hopeful in the situation is the indication of a probable lowering in the cost of material to such a point that, with reduced costs, builders will be able to make tempting responses to specifications. Pig iron warrants have now, on receipt of discouraging reports from America, declined to 52s. 6d. for Scotch and 46s. for Cleveland. To the equivalent of this reduced level, makers' prices must presently descend, with consequent reduction in finished material. Meanwhile steel ship plates are £5 17s. 6d. per ton less 5 per cent in Glasgow and £6 less 2½ per cent in Middlesboro. Of course, there are still far too many ships in the world, as the state of the freight markets and the prices of second-hand vessels show, but nevertheless low costs will tempt optimistic owners to buy again, though not just yet.

DESCRIPTION OF LARGEST WAR SHIP AFLOAT.

In my last letter I referred briefly to the launch by the Fairfield Co., of the battleship Commonwealth, the largest war ship now afloat. She is of 16,350 tons displacement, while the largest previous British ship was the Formidable of 15,000 tons. The hull of the Commonwealth is of admiralty quality mild steel. The ram, stem, stern post, brackets, etc., are made of cast steel. The weight of the ram is about 28 tons. There is a double bottom and close subdivision by watertight bulkheads and flats. The armor is on the Krupp system manufactured by Charles Cammell & Co., Ltd., at their Cyclops works, Sheffield. The depth of the broadside armor extends to 22 ft. (instead of 15 ft. as in previous ships), and the thickness varies from 9 in. above the water-line to 7 in. at the upper deck abreast of the vital parts of the ship, and 3 in. forward and 2 in. at the after end. To afford to the Commonwealth the same protection in the old type of armor as is given by the present system, the weight of material necessary would be from two to three times the weight of the armor actually placed on the ship.

The propelling machinery consists of two sets of triple-expansion engines, fitted in two watertight compartments, each set having four cylinders working on four cranks—one high-pressure 33½ in. diameter, one intermediate 54½ in. diameter, and two low-pressure 63 in. diameter, all adapted for a stroke of 4 ft. The high-pressure and intermediate cylinders are each fitted with a piston valve, and each low-pressure cylinder with a double-ported flat slide valve with a relieving ring at the back, all the valves being worked by the usual double-eccentric and link-motion gear. The reversing is effected by means of double-cylinder steam engines with gear of the all-round type, hand gear also being fitted. The crank, thrust, and propeller shafting is of forged steel, and hollow. Each of the propellers has a boss of manganese bronze, fitted with four adjustable blades of the same material. The main condensers are placed at the back of the engines. The feed, bilge, and hotwell engines are all independent and separate from the main engines, steam for these and all other auxiliary machinery being supplied by a special range of steam pipes. The auxiliary exhaust steam discharges to the auxiliary condensers, to the atmosphere, to the low-pressure receivers, and will also be utilized for working the evaporators. Feed-water filters will be fitted to prevent any impurities reaching the boilers. Steam is supplied by an installation of sixteen water-tube boilers of the Babcock & Wilcox type. The boilers are designed to work at 270 lbs pressure arranged in three watertight compartments. The necessary air for the furnaces and for the stokehold ventilation will be supplied by large steam-driven fans. Electric-driven fans will be fitted for the engine-room ventilation. The machinery on trial is to develop 18,000 I. H. P. and a speed of 18½ knots is to be obtained.

The Commonwealth is the first British ship to have the 6-in. guns protected by an extended battery with traverses instead of

in isolated casemates. The conning tower is oval and more roomy than former conning towers. The shields for the 12-in. guns are of considerably thicker armor than on previous battleships, and those for the 9.2-in. guns are of a new and heavy type specially adapted for this caliber. The armament consists of four 12-in. guns in pairs in barbettes forward and aft; four 9.2-in. guns singly in barbettes, one at each corner of the central citadel on either side of, but nearer midships than, the 12-in. guns, so that there is no interference with firing. The guns are arranged so that two 12-in. and two 9.2-in. can be fired ahead or astern, and on either broadside four 12-in. and two 9.2-in. There are also ten 6-in. guns, fourteen 12-pounders, fourteen 3-pounders, two machine guns and four torpedo tubes. The ship's complement will be about 775 officers and men.

The Commonwealth was ready for launching before the end of April but was kept back in view of the king's visit to Glasgow in hope that he might be present at the launch. This, however, could not be made to fit in with his other engagements. The construction of this vessel up to the launching stage within ten months is a record in ship building. The Commonwealth is the first battleship ever built at Glasgow (though many of other classes of war ship have been built there), and she will be the first completed in every detail before leaving the hands of the contractor. Her launching weight was 8,000 tons. The Commonwealth was very appropriately baptised with Australian wine.

SERIES OF SCREW PROPELLER TRIALS.

The special series of trials by the armored cruiser Monmouth to test a new form of screw propeller have now been completed. The earlier ships of the County class fell slightly short of their designed speed, although the contract requirements as regards engine power were exceeded. The new propellers of the Monmouth were given increased surface and greater pitch. The area was 80 sq. ft. as compared with 57 sq. ft. in the screws originally designed for earlier ships by the admiralty, and at the same time the pitch was increased from 19 ft. 2 in. to 20 ft. The boilers working at full pressure gave plenty of steam without trouble. At full power the engines of the Monmouth, running at a mean of 138 revolutions, developed 22,185 I. H. P. and the speed was 22.8 knots. The Bedford with the original propellers got 22.7 knots for 22,457 I. H. P. At four-fifths power the results were similar, the Bedford for 16,005 I. H. P. attaining a speed of 21.2 knots, and the Monmouth for 16,319 I. H. P. realizing 21.4 knots. The bottom of the hull of the Monmouth was very dirty and the weather was unfavorable, but when clean the 23-knots rate anticipated in their design will doubtless be exceeded. The Kent, after her hull was cleaned, added about a sea-mile per hour to her full-power speed when dirty. The addition to speed resulting from the change of propellers is scarcely as much as may have been expected. Progressive speed runs were also made by the Monmouth. With 1,748 I. H. P. the speed just exceeded 10 knots. For three nautical miles more it was necessary to more than double the power, making it 3,584 I. H. P. For 7,859 I. H. P. the measured-mile runs showed a speed of 16.93 knots, and to add two more miles per hour involved an additional power slightly exceeding that which was realized the first 13 knots, the power for 18.98 knots being 11,066 I. H. P. The next 2½ miles required 5,300 I. H. P. more, while the last 1½ knots took about 7,000 I. H. P. more. Thus the last mile takes as much power as the first 15 knots. The Monmouth was built by the London & Glasgow Ship Building Co., Glasgow.

COMBINATION OF SHIP YARDS—MISCELLANEOUS MATTERS.

The announcement of an amalgamation between the ship building firms of C. S. Swan & Hunter and J. Wigham-Richardson & Co., Newcastle-on-Tyne, marks the carrying out of a long-talked of project. The firm of Wigham-Richardson & Co. is one of the oldest ship building businesses on the Tyne. That of C. S. Swan & Hunter is rather more recent, but has developed rapidly, and the yard of this company is one of the best equipped in the kingdom. It is now capable of turning out vessels of the largest size, and has, indeed turned out monster vessels like the Cunard Ivernia. The firm of Swan & Hunter has been generally named as likely to be appointed to build one of the two 25-knot Cunarders under the agreement with the government but, notwithstanding previous reports, no contract has yet been placed for either of these. The founder of the firm of Swan & Hunter was formerly a partner in the firm of C. Mitchell & Co., which was amalgamated with Sir W. G. Armstrong & Co., a good many years ago.

The twin-screw steamer United States, built by Alex. Stephen & Sons, Ltd., Glasgow, for the Forende Dampsksib-Selskab of Copenhagen, after a very successful trial, has left for Copenhagen. The United States is a vessel of about 10,500 tons gross, highest class in Bureau Veritas with special strengthening beyond classification requirements. Her length is 520 ft. and breadth 58 ft. She is of a special design for the trade from Copenhagen to New York, including shallow draft, large carrying capacity and good speed. Ample space is provided for 131 first-class, seventy-six second-class, and 1,306 emigrants, 276 of these being in rooms. All these classes have spacious dining and sitting rooms, lavatories, etc., the first and second-class accommodation being particularly handsome and well finished in every respect. A special feature in the design is the high freeboard, which not only makes a most comfortable passenger vessel, but also one exceptionally strong. The two sister ships to this vessel, also built by Stephens, have already proved to be favorite ships. One of them, the Oscar II., is at present in the builders' hands undergoing repair, in

consequence of damage sustained at sea by striking a submerged wreck. The United States and the other sister ship, the Hellig Olav, which left the builders' hands just two months ago, were ordered on Feb. 17, 1902. Thus both have been completed and delivered in less than fifteen months.

The new steam yacht Lorena, built to the order of Mr. A. L. Barber of New York by Ramage & Ferguson, Ltd., Leith and fitted with turbine engines by the Parsons Marine Steam Turbine Co., Ltd., ran her official trial trip a few days ago, in the Firth of Forth. The mean speed of three double runs on the mile was found to be 17.904 knots, which is a fine performance. The length of the yacht over all is about 300 ft., with a water-line length of 245 ft. and a breadth of 33 ft. The displacement on trial was 1,700 tons. Steam is supplied by four cylindrical tubular boilers, fitted with Howden's system of forced draft.

There will be many on your side who will grieve to hear of the death of Mr. John Scott, C. B., head of the old firm of Scott & Co., ship builders and engineers, Greenock. Mr. Scott who was in his seventy-third year, had been ailing for some time, but for fifty years he was the actual leading spirit in the business which developed enormously under him and his brother, Mr. Sinclair Scott. Besides being a capable ship builder and engineer Mr. John Scott was a man of great culture, a keen yachtsman and a prominent Free Mason. He was made a companion of the Order of the Bath by the late Queen Victoria.

UNITED STATES SHIP BUILDING CO. REORGANIZED.

As announced in the last issue of the Review, the United States Ship Building Co. is undergoing reorganization. The plan practically cuts the present capitalization in half. It also reduces the fixed charges by about one-half. The necessity for reorganization is very clearly set forth in the opening paragraph of the circular which states:

"By reason of the excessive mortgage obligations of the United States Ship Building Co. its borrowing capacity and credit have become so seriously affected that outstanding notes are being pressed for payment, and the making of further loans is rendered impossible. The United States Ship Building Co. has been compelled from its organization to make advances from time to time to its constituent companies for working capital and cost of operation, of most of the available cash in hand. The reduction of the working capital thus disclosed and the impracticability of drawing upon the resources of the ship building plants have resulted in a material impairment of cash assets. The company will be unable on July 1, 1903, to meet the interest or sinking fund accruing on its first mortgage thirty-year bonds."

The capitalization of the present company consists of \$10,000,000 of twenty-five year 5 per cent collateral and mortgage bonds, \$14,500,000 of first-mortgage sinking fund gold bonds, \$20,000,000 of 6 per cent non-cumulative preferred stock and \$25,000,000 of common stock. The ship building company has a floating indebtedness of \$1,936,740 and the Bethlehem Steel Co. a floating indebtedness of \$1,398,524, making a total of \$3,335,264. The underlying liens of the Bethlehem Iron Co. are \$1,351,000 of 5 per cent first-mortgage bonds and of the Bethlehem Steel Co. \$7,500,000 of 6 per cent purchase money mortgage bonds. This makes a total capitalization and liability of the three companies of \$81,686,264.

It is proposed that the new company, in the acquisition of all the properties and assets of the ship building company and its constituent companies, including the Bethlehem Steel Co., and for the securing of additional cash working capital, shall issue \$12,000,000 of thirty-year 5 per cent first-mortgage gold bonds. These will be secured by a first-mortgage bond upon all the properties, including the plant and capital stock of the Bethlehem Steel Co. and of the Bethlehem Iron Co., subject only to the \$8,851,000 underlying mortgages of these two companies. The mortgage provides for continued maintenance for the first three years of the new company of \$6,000,000 of working capital in excess of all indebtedness of every kind, except bonded indebtedness, and \$7,000,000 thereafter. There are to be issued voting trust certificates for \$16,000,000 of 7 per cent non-cumulative preferred stock. This stock is preferred as to assets as well as to dividends. Voting trust certificates will be issued for \$15,000,000 of common stock.

The holders of the present 5 per cent collateral and mortgage bonds of the company are to receive all of the \$12,000,000 of new bonds pro rata upon furnishing \$2,000,000 in cash as additional working capital; also the interest due Aug. 1, 1903, upon the bonds deposited. The holders of the first-mortgage sinking-fund gold bonds are to receive 100 per cent in the new preferred stock, also the interest in cash due July 1, 1903. The rest of the preferred stock, \$1,500,000, will be issued to holders of the twenty-year 5 per cent collateral and mortgage bonds. Of the common stock \$2,900,000 is to be issued to holders of the present first-mortgage sinking-fund gold bonds, \$1,600,000 to holders of the twenty-year 5 per cent collateral and mortgage bonds, \$8,000,000, or 40 per cent of their present holdings, to the present preferred stockholders, and \$2,500,000 or 10 per cent to the holders of the present common stock.

The total capitalization of the new company will be \$43,000,000, and its fixed charges will be \$517,550 for interest on the underlying bonds of the Bethlehem Iron and Bethlehem Steel companies, and \$600,000 on the first-mortgage bonds of the new company, a total of \$1,117,550. To this should be added after the first five years \$250,000 yearly for the sinking fund to retire the new first-mortgage bonds. Continuity in the management of the new

corporation is to be secured by the creation of a voting trust for a period of seven years. The initial voting trustees will be Charles M. Schwab, George R. Sheldon, Max Pam, Charles W. Wetmore and James H. Reed of Pittsburgh.

A bondholder in explaining why it was necessary to give the holders of the collateral bonds the first claim upon the property said:

"Some criticism has been made of the drastic character of the plan of reorganization. I have carefully studied this plan and am convinced that it fairly recognizes and treats the various security-holders in the interest of conservatism and permanency. The Bethlehem Steel Co. supplies 80 per cent of the entire earnings of the United States Ship Building Co. It alone can pay the underlying bond interest, all the fixed charges of the new bonds issued and leave a surplus largely in excess of \$1,000,000. It is, in fact, the backbone and valuable property in the original consolidation.

"It appears clear that each of the United States Ship Building Co. plants was in serious straits at the time of the incorporation and their working capital was largely overestimated. The new cash furnished at the time of incorporation was soon exhausted and the company is now unable to meet the large floating indebtedness of more than \$1,000,000 and the approaching interest and sinking fund charges of \$1,000,000. A default being inevitable, what prospect would the holders of first-mortgage bonds have should they rely upon foreclosure of the mortgages? The holders of these bonds would be required to buy the ship building plants at foreclosure, and what would they have? They would have a number of ship building plants without earning capacity sufficient to pay interest charges upon any material proportion of the present bonded indebtedness. Even then they would have to raise several millions of dollars to pay the floating indebtedness and supply necessary working capital for operations. Who would be justified in contributing or raising this large amount of fresh capital? They would have securities for but a small portion of the bonded indebtedness upon the plants which have made such an unsatisfactory showing.

"It seems to me that the first-mortgage bondholders would answer this very readily by saying that there is no justification in assuming any such large burdens. Unfortunately, our bonds have no equity in the Bethlehem situation, as is shown by one of the paragraphs of the mortgage securing our bonds, and which evidently was insisted upon by the owners of the Bethlehem Steel Co. stock to assure absolute independence of control to the holders of the bonds issued on account of the Bethlehem stock in case of just such a contingency as has arisen. In fact, the first-mortgage bondholders have no right or interest in the Bethlehem stock or property whatsoever. Suppose we are to lose the Bethlehem Steel Co., where would we be? While the reorganization committee very properly makes no assurances or representations as to the payment of dividends on the new preferred stock, we can safely assume that dividend payments may be expected if the reorganization is promptly effected. In my opinion, the first-mortgage bondholders, under all circumstances, have been fairly treated, and should welcome by prompt participation the consummation of this conservative reorganization."

IMPORTATIONS OF MANUFACTURERS' MATERIALS.

Importations of manufacturers' materials into the United States in the fiscal year which ends with next month will be by far the largest in the history of our importations, and will amount to nearly or quite \$500,000,000. Manufacturers' materials will form about 48 per cent of the imports of the fiscal year. The ten months' figures of the treasury bureau of statistics, just completed, show that manufacturers' materials formed 47½ per cent of the imports for the ten months and 49.77 per cent, or practically one-half, of those of the latest available month, April; while in March they formed 49.06 per cent. Beyond doubt, the total importation of manufacturers' materials in the fiscal year 1903 will by far exceed that of any preceding year. The fiscal year 1902 was the banner year prior to the current year, its total being \$415,000,000, while the highest figure ever reached prior to 1902, was in 1900, when the total was \$380,000,000. A comparison of the prospective figures of nearly or quite \$500,000,000 in the fiscal year about to end with those of preceding years is interesting. The total of manufacturers' materials imported in the last two months was, in round terms \$91,000,000, and those of the ten months ended with April were \$410,608,866. Should the figures of May and June equal those of March and April, the total for the fiscal year, will be above the \$500,000,000 line. Comparing this with preceding years, it may be said that the total for 1902 was \$415,000,000; for 1900, \$380,000,000; 1890, \$263,000,000; 1880, \$233,000,000; 1870, \$120,000,000, and 1860, \$93,000,000.

The Dorothy Palmer, said to be the largest five-master ever built, was launched on Thursday last at the yard of George L. Welt, Waldoboro, Me. She is said to be as finely modeled as a yacht and is of the following dimensions: Length, 273 ft. on keel; beam, 46 ft. 6 in.; depth, 26 ft. 6 in. She has a very heavy oak frame, hard pine planking and the strongest fastening ever placed in a vessel of her size. Her five lower masts are of Oregon pine, each 118 ft. long, with topmasts of spruce, 60 ft. long. She will spread 12,000 yds. of canvas. Work will be immediately begun upon another five-masted schooner to be known as the Singleton Palmer and after that will be built still another, not yet named, all to be added to the Palmer fleet, of which W. F. Palmer of Boston is the managing owner.



NEWS OF THE GREAT LAKES

MILWAUKEE'S NEW FIRE BOAT LAUNCHED.

At the works of the Ship Owners' Dry Dock Co., Chicago, the new steel fire boat for the city of Milwaukee was launched on Tuesday. The steamer was christened by Miss Frances Connelly and is the first steel boat to be launched in the Chicago river. She is also the first vessel to be christened with beer, but as the town of Milwaukee is famous for this beverage it was thought appropriate to break a bottle of the blue ribbon variety across her bows. After the launching President C. A. McDonald, Supt. Watterson and Architect W. J. Wood entertained a number of Milwaukee city officials at dinner.

The new boat is built of open hearth steel and is of the following dimensions: Length over all, 118 ft.; length between perpendiculars, 107 ft.; beam molded, 24 ft.; breadth, extreme, 26 ft.; depth of hold, 12 ft. 9 in.; depth, molded, 13 ft. 6 in.; draught aft, 10 ft. 6 in.; draught forward, 10 ft. The hull is very thoroughly subdivided, having four transverse watertight bulkheads, a watertight flat over trimming tank forward and one over after peak; and in addition to these the coal bunkers are carried along

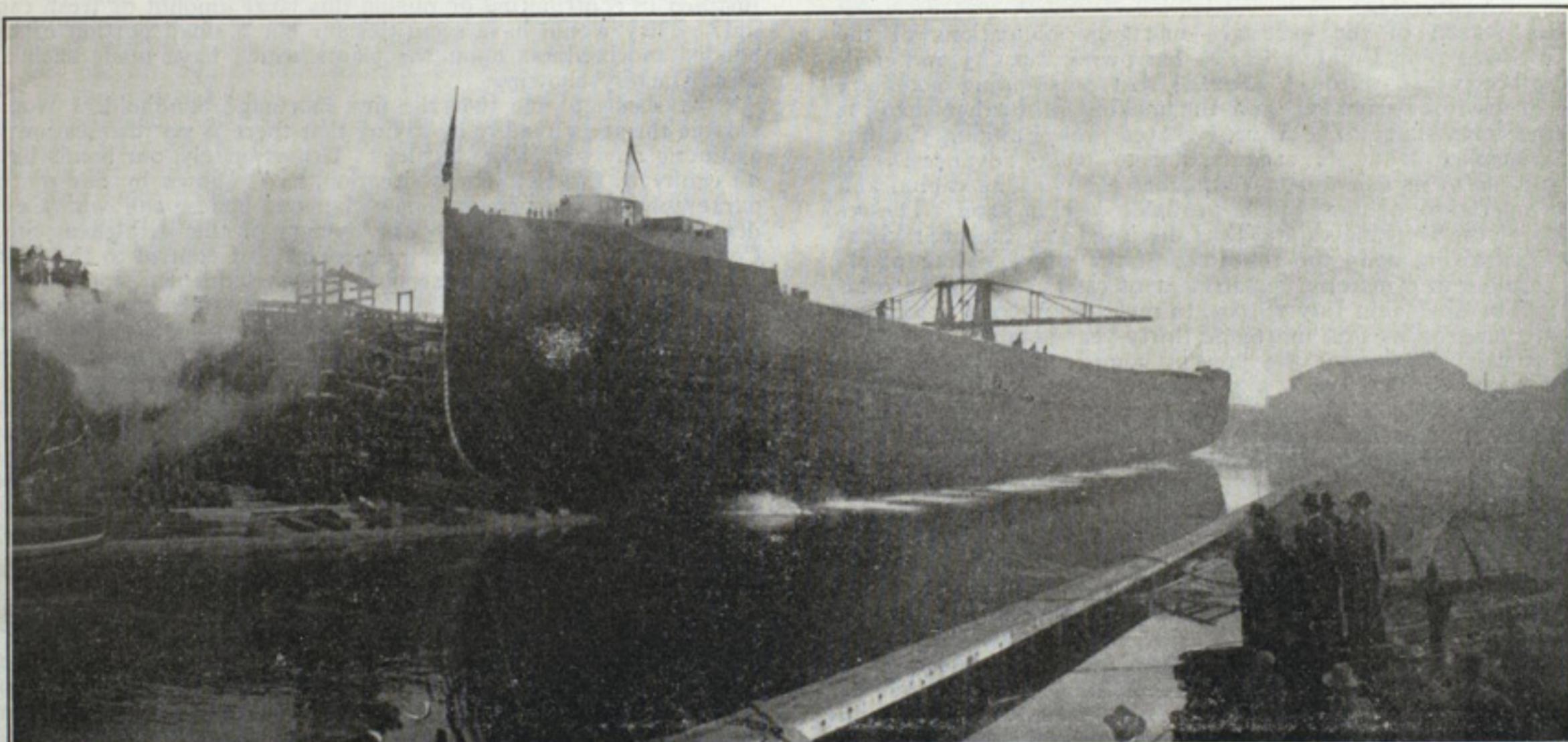
CARGO RECORDS OF LAKE FREIGHTERS

A cargo of 7,659 gross tons of iron ore, loaded at Duluth Saturday by the steamer Isaac L. Elwood of the Steel Corporation fleet, adds a few tons to the best previous record. Record cargoes of ore, grain and coal revised to date are:

Iron ore—Steamer Isaac L. Elwood, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,659 gross or 8,578 net tons, Duluth to Conneaut; steel tow barge John Smeaton, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,652 gross or 8,570 net tons, Two Harbors to South Chicago.

Grain—Steamer S. J. Murphy, Donora Mining Co., Duluth, 269,000 bushels of corn, equal to 7,532 net tons, South Chicago to Buffalo; steamer Douglas Houghton, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 308,000 bushels of clipped oats and 60,000 bushels of corn, equal to 7,520 net tons, Manitowoc to Buffalo.

Coal—Steamer I. L. Elwood, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,688 net tons anthracite,



Launch of the Steel Freighter D. G. Kerr, at West Superior, for the Provident Steamship Co.

the sides the whole length of boiler space, the coal bunkers thus forming with their watertight doors a cofferdam on each side amidships. On the deck is a continuous steel house 72 ft. 6 in. long and 14 ft. wide by about 6 ft. 9 in. high at side. In the forward end is the pilot house finished in mahogany with patent interlocking rubber tile floor in assorted colors. Abaft the pilot house is the hose room with two large reels to work in unison and coil the hose with no sagging from weight of brass or aluminum butts. On top of the deck there are two skylights of steel, one over the engine and the other over the pumps. The forecastle is reached through a hatchway aft of the capstan and here is located the bathroom and lavatories in fore end of compartment, piped with hot and cold water and steam heated. The bathroom is finished in white steamboat enamel and furnished with hardwood gratings over deck.

The main engine is of the vertical, inverted, two-crank, high-pressure kind, driving a single screw. The two cylinders are 20 in. in diameter and 20 in. stroke, to operate with boiler pressure of 140 lbs. Steam is supplied by two Scotch boilers, 12 ft. diameter by 11 ft. long. Two Worthington Admiralty type duplex pumps are installed, placed one on each side of the boat in pockets in stokehold. Forward of the engine and in the same compartment are three double-acting, vertical, simple, duplex, crank and fly-wheel pumps. The steam cylinders are 17 in. diameter and 11 in. stroke. Each pump will have a minimum capacity of 3,000 gallons per minute with a pump pressure of 170 lbs. per square inch. Connecting with the set of pumps are two 10 in. circuit water main pipes running along the sides just below the deck and coming together under the standpipes at forward and after ends of deck house. The boat will be lighted throughout by electricity.

Buffalo to Duluth; steamer John W. Gates, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,659 net tons of bituminous, Lorain to Duluth.

CANADIAN SHIPPING NOTES.

Col. M. J. Burke, United States consul at St. Thomas, Ont., on May 22, presented Capt. Alex Brown of the Gordon Brown of Port Stanley, and Coxswain J. Reginald Moore of the life-saving crew with gold watches and chains, and William Hough, Frank Eveland, Alonzo Taylor, Fred Pollock, Thos. Hough and Henry Cherry with medals, on behalf of the president of the United States for their gallantry in saving the crew of the United States schooner Mineral State, wrecked off the port Oct. 20, 1902.

The organization of the Canadian Pacific Railway Co.'s Steamship Lines (such is the title) has been completed, A. Piers being manager. The constituent lines will be named as follows: Pacific Service, Atlantic Service, British Columbia Coast Service, Upper Lake Service, and British Columbia Lake and River Service. Each of these lines will be under the charge of a superintendent, who will be responsible to the manager.

The Grand Trunk Pacific Ry. promoters state through C. M. Hays that a fleet of steamers will be placed on the upper lakes, to operate connection with that company's lines, capable of handling 30,000,000 bu. of grain before the close of navigation and that the company proposes to store an additional 20,000,000 bu. at Ontario lake ports for transportation to the seaboard during the winter months.

The Welland Canal Tug Co. has been incorporated under the Dominion companies' act with a capital of \$95,000 to carry on

a general towing business on the Welland Canal and the great lakes. The head offices are at Port Colborne, Ont., and the incorporators are Dr. W. Carter, C. S. Carter, F. W. Carter, Mrs. R. R. Carter and Mrs. M. Macdonald, all of Port Colborne.

Locks of the Lachine Canal, Montreal, are being lengthened from 200 ft to 270 ft., the standard canal size. The new locks will have a width of 45 ft., a depth of 32 ft., with 17 ft. of water on the sills. The work is expected to be completed by May 1, 1904.

Capt. J. H. Campbell, formerly in command of the Dominion government cruiser Newfield, until she was wrecked in 1901, and recently conducting a marine academy at Halifax, N. S., died there recently.

A steam tug, the Mills, recently completed at Owen Sound, Ont., for the Manitou Iron Co. is being taken overland from Manitowaning to Lake Manitou, a distance of over five miles. The lake on which she will operate is eighteen miles long by six miles wide.

The Toronto Ferry Co. has had built at Oakville a new steamer, the Kathleen, which was placed in service a few days ago between Toronto and the island.

The steamer Wexford, recently purchased in England by Capt. Bassett for the Western Steamship Co. of Collingwood, Ont., has reached Montreal, where she is discharging general cargo.

The steamer under construction by the Collingwood Ship Building Co. for the St. Lawrence Navigation Co. will be launched June 20 and will be named W. D. Matthews, for one of the directors of the company.

The Owen Sound board of trade is contemplating promoting a project for the construction of a large dry dock there. The matter was last under consideration in 1898, but nothing was done.

The Bertram Engine Works Co., Toronto, is negotiating with the Rainy River Navigation Co. for the construction of a steamer for the Lake of the Woods trade.

The Clavet dock at Port Arthur is being extended 100 ft. and storage warehouses will be erected thereon.

AROUND THE GREAT LAKES.

Conneaut received during May 554,939 tons of ore. This is an increase of 115,711 tons over the same month last year.

Capt. Fred. Houghton will command the large freighter James H. Reed, just launched at Detroit for the Provident Steamship Co., A. B. Wolvin manager.

Capt. George Williams of the schooner Ishpeming, who fell to the dock while boarding his vessel at Racine on Monday, died on Tuesday of concussion of the brain.

The steamer Easton, sold recently by the Dunkley-Williams Co., South Haven, Mich., to the White Star Line of Duluth, took her first excursion party out of Duluth on Sunday.

Capt. Patrick Gordon was washed overboard on Lake Superior a few days ago from his vessel, the barge O. C. Maxwell. Capt. Gordon had sailed the lakes for forty years. He was sixty years old.

The fast passenger steamer City of South Haven building at the Craig works, Toledo, for the Dunkley-Williams company, and which is nearing completion, will probably leave for South Haven on the 20th inst.

Specifications for the construction of the second ship canal at St. Clair flats, for which the last congress appropriated \$330,000 are being prepared by Major W. H. Bixby, United States engineer of Detroit.

On Tuesday afternoon the steamer George Presley, light, crashed into the Superior street viaduct, Cleveland, and carried away her foremast and mainmast and smokestack. It will take about a week to repair her.

The steamer City of New York has been sold by the estate of Capt. Thomas Currie, Port Huron, to George Wilkinson and others of Sarnia. The City of New York was built in 1863. She will be given Canadian registry.

In a large, attractive postal card General Passenger Agent Joseph Berolzheim of the Manitou Steamship Co., Chicago, announces that on Thursday, June 18, the steamer Manitou inaugurates regular tourist service to Northern Michigan points.

On Saturday of this week the Tomlinson steamer Saxona will be launched at the Cleveland yard of the American Ship Building Co. The Saxona is one of three large steam freighters which Mr. G. A. Tomlinson of Duluth is bringing out this season.

Some bad grain shortages are again showing up from Fort William. Owners of the steamer Thomas Cranage have a mystery on their hands in the form of a 1600-bu. wheat shortage that developed a few days ago in a cargo taken from Fort William to Buffalo.

Customs authorities at Port Huron last week assessed a fine of \$1,000 on the Canadian tug Sarnia for not taking out clearance papers. An additional fine of \$140 will be imposed for towing the American schooner Charlie Crawford from Lake Huron to Port Huron in violation of the coasting laws.

A value of \$110,000 each is given to the new canal steamers of the Great Lakes & St. Lawrence Transportation Co., in the Inland Lloyd's Register. The rating is A 1. The same value and rating are given to the steamer Wahcondah, built in England and which is being operated on the lakes by the Mackays of Hamilton, Ont.

Managers of the Lumber Carriers' Association met in Detroit

Tuesday and made some minor changes in freights, but did not change the main schedule, which is based on \$2.50 from the head of the lakes to Lake Erie ports and Chicago. On account of the abolishment of the 30-cent rate on lumber passing through the Welland canal, the carrying rate will be reduced accordingly to ports affected.

President Keefe, of the International Longshoremen, Marine & Transport Workers' Association, a few days ago signed at Fairport for the package freight handlers an agreement with their employers that gives them for this season a slight advance over last year's schedule. The men working on the boats will be paid at the rate of 30 cents an hour and for house work they will get 22½ cents an hour. Men that are employed in the freight house will receive 30 cents an hour while vessels are being unloaded.

Mr. A. Geo. Mattsson, one of the ablest of the engineers who have had to do with the designing of engines for lake vessels, and who was with the Detroit Ship Building Co. for a number of years, has resigned and accepted with the new Canadian Ship Building Co. a position similar to that which he held at Detroit. The Canadian Ship Building Co. is the organization in which Mr. A. Angstrom, formerly with the Bertram Engine Works, is a leading spirit, and which is engaged in erecting a large plant on Niagara river.

The Chicago works of the American Ship Building Co., is just now putting down the keel for the large package freight steamer ordered several months ago by the Western Transit Co. of Buffalo. This steamer is to be 401 ft. over all, 381 ft. keel, 50 ft. beam and 30 ft. depth. Engines are to be quadruple expansion with cylinders of 20¾, 30, 43½ and 63 in. diameter and a common stroke of 42 in. There are to be three Scotch boilers of 12½x11½ ft. fitted with Howden hot draft. The steam pressure is to be 210 lbs. This steamer is to cost about \$350,000.

Milwaukee's fire boat was launched on Tuesday at the Ship Owners' Dry Dock Co.'s yard in Chicago. A departure was made in the ordinary form of christening, neither doves being released nor champagne bottles broken. It appears that the town for which the boat is building is famous for making an amber-colored beverage out of a combination of malt and hops which has attained considerable popularity as a cheap and wholesome drink. Its generic term is beer though it is more specifically designated as Schlitz or Pabst. A bottle of this liquid was broken across the bow of the fire boat as it left the ways.

Referring to changes that should be made in the steamboat regulations by the supervising inspectors now in session in Washington, Mr. C. B. Calder of the Detroit Ship Building Co. says: "We think cast iron is almost an indispensable metal for stop valves and mountings on marine boilers. We ought to be allowed to use it if we make the thickness so that the strain will not exceed a certain percentage of the tensile strength, if we chose to have it tested, and name a strain that would be allowed on cast iron if no test was made of it. We have made several attempts to use cast steel flanges. They are so porous and leak so, they are a commercial failure."

While a large number of men are rushing the new Allouez ore dock at Superior to completion, Great Northern officials do not expect to see the work finished until July 1. The installation of a new electric light system will doubtless expedite the work of dock construction as well as to generally improve the situation on the docks. "When I look back and note the wonderful strides made by the company in the shipment of ore to and from the Allouez docks the results seem almost an impossibility," said Supt. D. M. Philbin. "For example, in 1892 the shipments reached 4,245 tons. The 1893 shipments went up to 80,274 tons. Then in 1895 the shipments reached 117,883 tons. Last year they were 4,180,569 tons."

SHIP BUILDING DURING MAY.

The bureau of navigation, treasury department, Washington, D. C., reports 126 vessels of 53,530 gross tons were built in the United States during May as follows:

	WOOD.				STEEL.				TOTAL.	
	SAIL		STEAM.		SAIL.		STEAM.			
	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.		
Atlantic and gulf.	43	6,888	25	1,112	2	4,493	6	12,127	76 24,570	
Porto Rico										
Pacific	2	42	16	1,979					18 2,021	
Hawaii										
Great Lakes	1	8	5	127			9	25,766	15 25,901	
Western rivers.			16	798			1	240	17 1,038	
Total.	46	6,888	62	4,016	2	4,493	16	38,133	126 53,530	

The largest steel steam vessels included in these figures are the D. G. Kerr, Sinaloa, Anna C. Minch, Monroe C. Smith, Charles M. Warner, built on the great lakes by the American Ship Building Co.; City of Macon, built at Roach's ship yard, Chester, Pa.; and Ligonier, built at the New York Ship Building Co.'s yard at Camden, N. J.

During the week the newspapers have been circulating a report that the Bath Iron Works is to be removed to New London, Conn. No verification has been received and nothing is known of the reported change at the offices of the Eastern Ship Building Co., New London.

PROBLEM OF BUILDING WARSHIPS ON THE GREAT LAKES.*

By H. C. SADLER.

With the conditions of armed peace which obtain at the present day throughout the world it is necessary that every first-class power should possess a navy. In the case of nations whose commercial interests are widely distributed the possession of a strong naval force, capable of doing distant work, has often proved more than a powerful moral factor in connection with international disputes. It is not intended in the present article to discuss naval policy, but it may be taken for granted that under existing international affairs the United States must continue to keep her place among the maritime nations of the world.

The policy of a nation building its own warships has perhaps reached its highest state of development in Great Britain and France where it is possible by reason of the proximity of the dock yards to maritime and manufacturing centers, to do the work reasonably and rapidly as compared with private firms. But even in these countries, since the adoption of implied or defined naval policies, and owing to the demand for speedy delivery of vessels, it has been found impossible to construct more than 50 per cent of the battleships and cruisers in the government establishments. The small vessels, such as torpedo boats and destroyers, are built almost exclusively in private yards. In fact, if Great Britain and France had relied solely upon the admiralty dock yards to carry out their latest programs, there would have been such delay in building the vessels that some of the first vessels to be constructed would have become somewhat obsolete before the last were finished. The same is true in other countries, the government dock yards being a necessity for repair and commission purposes, but performing a small part in the actual building of the navy.

In the United States this question has been carefully considered, and the comparative ability of the navy yards to build as cheaply, efficiently and rapidly as the private concerns is now being tested. When it was decided, some seventeen years ago, to rehabilitate the navy, one of the first problems with which the government was confronted was the ability to construct the required ships with the resources and facilities in existence. Few, if any, of the government dock yards were properly equipped to undertake the construction of modern vessels, especially in any numbers, and the authorities were therefore compelled to turn to the private builders for help in carrying out the required work. At that time, owing to the moderate naval programs projected, the resources and equipment of a few firms which were capable of constructing the necessary ships proved ample for the needs of the government. But the day of small vessels and moderate programs has passed, and, owing to the events that have occurred during the past few years, the United States must of necessity increase her navy. The continual increase in size of warships that is taking place has narrowed the field of contractors capable of building such large vessels to small limits, until to-day there are less than a dozen ship yards to which such work can be entrusted. As the government has always had difficulty in retaining the services of skilled men at navy yards, and as the purchase of government material cannot be expedited as in the case of private firms, the navy department would seem to be at a disadvantage in undertaking such work. The private ship builders have, therefore, played the most prominent part in the construction of the present navy, although in many instances they have been enabled to arrive at their present state of experience and prosperity by the helping hand which the government held out to them in the early days.

In the United States at the present day there are some ten ship yards which undertake the larger government contracts. Most of these are situated on the coast, but there is still a large region where the ship building industry has been flourishing for a number of years, and which, up to the present, has not been used to assist the government in building up the navy, namely the great lakes. In this district there are some fourteen ship yards and engine shops, well equipped with modern machinery and capable of building vessels up to 500 ft. in length, and some forty smaller yards. With regard to dry docks and marine railways, there are thirty-nine, one over 600 ft., three over 500 ft., seven between 400 and 450 ft. in length, with draughts on sills varying from 19 to 21½ ft., besides many smaller ones in the neighborhood of 300 ft. in length. The navigation period varies, but on the average the lakes are open from the second week in April until the second week in December. During the last two years some forty steel vessels have been built on the lakes each year, and this does not include small craft, such as tugs, etc.

With such ship building facilities at hand, it is the object of the present article to discuss the means by which these could be utilized to help in the building of the navy. The principal points that will be considered in connection with this subject are: (1) The present agreement with Canada and Great Britain with regard to the question of warships on the great lakes. (2) The means of moving to the coast vessels built on the great lakes. (3) The ability of the lake ship yards to construct war vessels. (4) Whether the cost of construction in this region will compare favorably with that of yards on the sea coast.

There is no formal treaty between the United States and Can-

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ada with regard to keeping armed vessels on the great lakes, the present *modus vivendi* dating from an agreement between these two countries of April 28, 1817, and comprising two letters between Mr. Bagot and Mr. Rush. According to these, each country agrees to confine itself to the following vessels: "On Lake Ontario to one vessel not exceeding 100 tons burthen and armed with one 18-lb. cannon. On the upper lakes to two vessels not exceeding like burthen, each armed with like force; on the waters of Lake Champlain to one vessel not exceeding like burthen and armed with like force." It further states that "all other armed vessels on these lakes shall be forthwith dismantled and that no other vessels of war shall be there built or armed;" and that "if either party should hereafter be desirous of annuling this stipulation and should give notice to that effect to the other party, it shall cease to be binding after the expiration of six months from the date of such notice."

Situated as the United States and Canada are in this region, it will be generally conceded that the above agreement, so far as *keeping* armed vessels on the lakes is concerned, is a wise one. The small vessels above mentioned simply fulfill a general police duty, and it would without doubt militate against the interests of both countries to keep these waters patrolled by regular fleets of war vessels. If this agreement should be discontinued, then each time one country commissioned a vessel the other would of necessity have to do likewise, and a state of affairs would eventually be produced similar to that which obtains in Europe at the present day. The second part of the agreement, however, stipulates that "no vessel of war shall be there built or armed." When this agreement was made the great lakes were purely inland seas, and therefore ships built on their shores were destined to remain in these waters. It was impossible at that time for vessels of any size that could be built in these regions to be taken to the coast. Now, however, with the completion of the Canadian canals, vessels up to 260 ft. in length are enabled to pass from the lakes to the sea. Since these waters are practically open to the sea, it seems reasonable that, provided each country would agree to let the first part of the present agreement stand *i. e.*, not to *keep* war vessels on the lakes, there should be no objection to either country building war vessels there if on completion, or if necessary before the armament is put on board, these vessels to be taken to the seaboard. In fact, as the treaty now stands, if all of the converted yachts used in the late war with Spain had been built on the lakes (and some actually did come from these waters) no objections could have been raised as to their use as gunboats, provided that they were not armed before they left that region. Most war vessels in any case have to be taken to the navy yards to complete their outfit, so the question of arming these at the lake ship yard is not of very serious moment. The spirit of the present treaty is that neither country should keep a fleet of war vessels on the great lakes, and this principle, as already stated, should be observed by both nations, but with the waters of the great lakes now open to the sea, and with the possibilities of more outlets in the near future, the clause as to building war vessels does not have the same weight to-day that it did when the agreement was first signed. Speaking without the weight of authority, it is nevertheless the writer's opinion that neither Canada nor Great Britain would raise objections to the reconsideration of this matter, as it is one that would affect both countries in the same manner.

In the event of such an agreement as above outlined, the question which would confront this country would be a proper outlet to the sea. At present the only passage way for vessels of any size is the Welland canal and St. Lawrence river route, practically all in Canadian territory. The largest vessel that can be taken through this canal is one of approximately 260 ft. length by 40 ft. beam and drawing about 14 ft. of water. All vessels, therefore, of the small cruiser or gunboat type could readily be taken to the coast by this route. The United States does not at present possess any outlet approaching this size, and although a discussion as to the advisability of this government providing a ship-canal to the coast is beyond the scope of the present paper, this question is one that cannot be too strongly urged by everyone who has the maritime interests of the country at heart.

The contemplated Erie canal improvements, though necessary, do not attempt to give the outlet required, and this will be, as its name signifies, simply a "barge" canal. The report of the United States Deep Waterways Commission of 1896 discusses all the principal canal routes from the lakes to the sea, and amongst its conclusions it is stated that, in the opinion of the commissioners, a channel of not less than 28 ft. depth should be constructed, and that this is a perfectly feasible project. Such a canal would fulfill all the requirements of a barge canal, and would at the same time give an outlet for larger vessels.

The argument that vessels suited for lake work are not suitable for seagoing purposes is generally true as regards the large freighters, but many of the smaller and coasting type could be made suitable for both purposes. In any case, provided that canal charges were not excessive, a great saving would be effected if vessels could carry their cargoes directly to a seaport and there discharge into seagoing vessels. In the latter case the cargo is

only handled twice, whereas with the present method it must be handled at least four times. It may not be generally known that a number of vessels ply on the great lakes in summer and engage in sea work during the winter months.

The opinion seems prevalent, especially amongst people on the coast, that the vessels plying on the great lakes are somewhat roughly built and that work suitable for lake vessels would not pass muster on the coast for seagoing work. There is, no doubt, a certain amount of truth in this, but the general statement requires considerable modification. In the first place, it should be clearly understood that as far as the typical lake freighter is concerned, these vessels are built solely for the purpose of carrying as much cargo as possible upon a limited draught. In general arrangement they are designed to fulfill conditions which do not obtain on the coast; structurally they are arranged to suit these conditions, and they are, for the work they have to do, relatively as strong as the corresponding type of seagoing vessels. The question of appearance does not enter into the design, or, if it does at all, it is of comparatively small moment. Provided that the vessel is built of good material and all parts properly riveted, minor details, such as slight unfairness in the plate edges and the like, do not affect the structure from the point of view of its efficiency for the purpose for which it was designed. In fact, on account of the service that these vessels have to perform it would be so much waste of energy and money to put on what may be called a high finish. The writer's observations go to show that these vessels compare very favorably with the similar type of vessel built for seagoing purposes in the home of the "tramp" ship building industry, namely, the northeast coast of England. It should be clearly understood that the lake freighter is not exactly "thrown together," but simply that a fine finish to the work is neither demanded nor exercised.

There is no occasion to apologize for the lake freighter, but as one is apt to judge the abilities of lake ship builders from a few isolated cases, the above points have been mentioned to disabuse the minds of some who may have formed erroneous ideas as to these vessels. The freighter is not, however, the only type of vessel on the great lakes. The combined cargo and passenger and the purely passenger and excursion types form object lessons to any one who doubts the ability of the ship builders in these parts to turn out first-class work, such as will bear comparison with the best that can be produced in any of the coast yards. Here, when fine finish and neat work is required, these conditions are fulfilled, and strange as it may seem by the same workmen that build the freighters. After all it is a question of the workman, and seeing he is very often the same man who is sometimes in one place and sometimes in another, there should be no reason why his work in one place should be inferior to that in another. Many illustrations could be given of vessels of this latter class, but a few, such as the North Land and North West, Eastern and Western States, Manitou, Tionesta, Huronic and the vessels of the Detroit and Cleveland, and Detroit and Buffalo lines, as well as such excursion vessels as the Tashmoo, etc., may serve as showing that when the occasion demands the lake ship yards can turn out high-class work. Within the last few years a number of vessels have been built on the lakes for seagoing purposes, most of them under Lloyd's supervision, and any one who has had occasion to come in contact with this august body will realize the small chance that anything but first-class work has of passing its somewhat exacting requirements. There can be no doubt, therefore, that on the score of workmanship demanded in war-vessel construction, the ship yards of the great lakes would have no difficulty in fulfilling all the requirements.

In the minds of some there still exists the idea that ships can only be built on or near the coast line of a country. Provided that there are adequate means of getting vessels to the sea, the actual point at which they may be built need not necessarily be determined by the fact that they must eventually operate in salt water. In fact, the nearer the manufacturing plant is to the plant producing materials required in its work the cheaper in general will be the cost of the finished article. So in the case of a ship, it is cheaper to move it a given distance when finished than to pay the freight for the corresponding distance on all the raw materials used in its construction. The cost of construction may be divided into two parts—material and labor. The labor cost, for all practical purposes, may be taken as being approximately constant in similar yards with similar equipment. Where general shop arrangements are inferior the cost of labor will naturally be greater than where these are kept up to date. As far as the hull proper is concerned, the cost of material includes that of iron and steel, wood and outfit, and of these that of the iron and steel forms one of the principal items. This cost may be taken as meaning the cost of material delivered at the yard, and this depends upon the cost at the mills plus that due to transportation to the works. It is evident that the nearer the ship yard is to the production of iron and steel the cheaper will be the cost of this item. The actual proximity of the two, as above stated, does not, however, govern the situation entirely. The cost of transportation by water is usually much less than by rail, and of two works so situated that one is enabled to get its material by water and another by rail, the former will in general pay less for transportation than the latter. This last remark has special bearing in connection with the ship yards situated on the great lakes. A casual glance at the map of the United States will show the immense tracts of country in direct connection with these waters. From the rich ore deposits of the Lake Superior region to the many manufacturing centers of

Ohio, Pennsylvania and New York state is one continuous line of communication where the transportation charges are the cheapest in the world. A comparison of these charges with those of the railroads may prove of interest. During the year 1901 the average rate per ton mile on the lakes was .99 of a mill, or less than one-tenth of a cent, while on the railroads the best rate was 3.5 mills. The average of the figures for the past ten years is for lake transportation 1.04 mills, and for railroads 3.75 mills.

The near future will doubtless see a great development of manufacturing industries of all kinds along the shores of the great lakes. Already there are a number of steel and iron works, such as those at Chicago, Detroit, Cleveland, Buffalo, Lorain and at other points with deep-water terminals. The proximity of the ore deposits to available sources of water power, such as that at the Sault Ste. Marie falls, will tend, for reasons stated above, to bring steel and iron manufacturing industries to such points. Even the leading steel and iron center, Pittsburg, is nearer to many of the Lake Erie ports than to any of the principal coast cities. Within a radius of about 200 miles from Pittsburg there is practically included all the lake cities between Buffalo and Detroit. The majority are well within this radius. The distance from Pittsburg to Philadelphia and New York is 100 miles farther than to Lake Erie ports. So far, then, as the lake and Atlantic coast ship yards are concerned, as regards securing iron and steel used in the construction of both hull and machinery, the difference as to cost will be to the advantage of the lake establishments.

Actual comparative costs of vessels built on the great lakes and the seaboard are difficult to obtain, as the types are dissimilar. The conditions of trade, fresh water as against salt, and methods of construction cause variation in design that tend to vitiate direct comparison. Judging from a few cases where comparison is possible, the cost of vessels built in these districts is slightly lower than that of similar vessels built on the coast. It may be said in objection to the last statement that in some cases of small government vessels upon which both coast and lake yards have been asked for bids the former have obtained the contracts. The result has been disastrous to the bidder and such cases simply show that occasionally methods of estimating costs are superior in the lake yards. The cost of a vessel is not necessarily its contract price, as many have found out to their sorrow. The difficulty sometimes lies in the fact that the plans and specifications for a vessel are not consistent with the amount of the appropriation. It is true that in general government vessels are relatively more costly than merchant ships, due to a number of causes, some of which have received considerable discussion; but this is, or ought to be, a well-known fact, and should be allowed for in making up the contract price. In case of loss the fault lies largely with the bidder and not altogether with the government. Another factor which enters into the cost of construction is the time required to build the vessel. A few examples of the time taken for various types of vessels built in the lake shipyards may be of interest in connection with this subject:

Type.	Length, feet.	Launched, days.	Delivered, days.	Weight of metal, tons.
Bulk freighter.....	410 to 420	175 to 180	220 to 250	2,200 to 2,400
Package freighter.....	360 to 380	214 to 217	240 to 270	2,000 to 2,200
Passenger steamers.....	360 to 370	260 to 270	430 to 450	1,200 to 1,300
River steamers.....	270 to 300	330 to 340	450	400 to 450

The above table is made from vessels as actually built, no deduction being made for delays of any kind. The number of days to the time of launching and delivery are reckoned from the time of signing the contract, not from the first delivery of material. It will be noticed that the time for the river steamers, as given, is long, compared with the other types, but in this case the delay was due to failure to get material. With prompt delivery the figures would be reduced to about 200 and 250. The actual recorded time for one of the large type of freighters, from the laying of the keel to the launch, was ninety days. It also frequently happens that, owing to the state of navigation, a vessel is completed some time before actual delivery, so that the times, as given, do not represent the best that can be done. It was, however, thought preferable to give actual figures including delays from all causes.

In this article an attempt has been made to bring out the possibilities of the lake ship yards and engine works with regard to government work; and it has been shown that so far as quality of workmanship, cost of production and speed of building is concerned, there is nothing to hinder these yards from competing successfully with any in the country. The two obstacles at present in the way are the standing agreement with Great Britain with regard to building war vessels on the great lakes and the absence of facilities on the United States side for getting vessels so built to the coast. Both of these, and especially the latter, should receive the immediate attention of the government, as apart from the purposes here discussed the commercial advantages that would accrue from opening up the great region of the west to the coast would, in time, tell upon the prosperity of the country. The United States must, as years go by, increase her merchant marine, and everything that is possible should be done to foster shipping and ship building. With an adequate outlet to the sea the ship yards of the great lakes would be immediately brought into play to help in building up this industry.

REVISION OF BOILER LAWS OF UNITED STATES STEAMBOAT INSPECTION SERVICE.*

By COL. E. D. MEIER.

A revision of these laws has been urged by the committee on "Uniform Boiler Specification" of the American Boiler Manufacturers' Association. After careful investigation and discussion of the whole subject by this committee, they met the board of supervising inspectors of steam vessels by invitation on Jan. 28, 1903, and presented the matter fully to the board. Thereupon Mr. Robert S. Rodie, supervising inspector of the second district, offered the following resolution:

"Whereas, a committee of the American Boiler Manufacturers' Association has laid before this board a comprehensive plan for an entire revision of the present boiler law of this inspection service, as per copy of letter to Senator Frye attached hereto, which is to be undertaken by an expert commission representing all interests involved.

"Be it resolved that the board recognizes the force and fairness of this proposal, and trusts that such action may be taken, and pledges its hearty assistance and co-operation."

This resolution was unanimously passed. The committee then called in a body on the secretary of the treasury and on the chairmen of the proper committees in the senate and house, finding everywhere favorable consideration. The shortness of the session and the fact that the time was so fully occupied with the Panama canal and the Cuban reciprocity bills prevented any action at this time, although the senate bill (S. 7243), presented by Senator Frye, was twice read and referred to the committee on commerce, who reported it without amendment. The necessity and wisdom of the course proposed being thus generally acknowledged, the committee will bring up the matter in the next session of congress, where it is hoped speedy and favorable action will be obtained. There are so many interests involved in this measure that a short history of the work and discussions which led up to it seems pertinent. The importance of the control intrusted to the steamboat inspection service also demands a short statement of what has been accomplished, in order to better explain the necessity of revision.

LEADERS IN THIS MOVEMENT.

There is sound reason why the American Boiler Manufacturers' Association should lead in this matter. This association was founded in 1889 for the express purpose of improving the boiler business of the United States by establishing the highest standards for workmanship and material. The first work of the association was the adoption of standard materials, which have since become known to the trade by the initials of the association, "A. B. M. A." The next step was the appointment of a committee on uniform boiler inspection laws, and successive committees did yeoman service in various states, in 1890, '91, '92, '95 and '96. In each case, after most strenuous work generally with the intelligent assistance of various societies of steam engineers, the result was failure. The reasons were always the same. The legislators concluded that any inspection law would work hardship to the manufacturers and purchasers of the many portable boilers which are used for farm machinery, for oil wells, etc. It was the usual experience which every reform and improvement meets, those needing the inspection most opposed it most violently. The writer found at that time that from 1886 to 1896, inclusive, there were reported only 157 explosions of boilers in cities and towns against 1,985 in the country districts, although the total steam power in the former, where large manufacturing establishments are located, greatly exceeds that of farms, saw mills, etc. But this continued experience forced upon the association the recognition of the fact that the public conscience was not educated up to the necessity for intelligent inspection and control, and an educational campaign was decided on as the only recourse. The committee on materials and tests had been acting in this line from the beginning, and was able to report increasing success, inasmuch as engineers all over the United States and in many foreign countries fully accepted the A. B. M. A. standards.

At the Philadelphia convention of 1897 the writer suggested the appointment of a committee to draw up uniform specifications for American boilers, based on the experience of the membership as laid down in reports and topical discussions extending over a period of eight years. This committee held several meetings during that and the following year, and on Oct. 3, 1898, presented its final report to the convention assembled at St. Louis. After a very full and active discussion, resulting in some minor amendments, this report was unanimously adopted by the convention on Oct. 4.

Meanwhile there had been frequent complaints as to the embarrassments created in marine boiler work by the antiquated laws and arbitrary rulings of the steamboat inspection service. As far back as 1892 Senator Frye introduced a bill which was intended to correct these evils. Unfortunately, the technical work on this bill was done in private and without any consultation with or any discussion by the great interests it effected, *i. e.*, plate manufacturers, boiler builders and ship owners. While the work as a whole reflected great credit on the engineers who selected the rules, there were many practical difficulties and present necessities which it did not reach at all. At a meeting of the ma-

rine engineers and boiler builders of New York city and neighborhood the statement was made that it seemed to be formulated and its provisions copied after rules of the board of trade of Great Britain. On examination it was found that its specifications for material were less precise and exacting than those of the A. B. M. A. No chemical tests were prescribed for the materials and good local practice was entirely ignored. This bill was fully discussed by the A. B. M. A., with representatives from the Atlantic seaboard shipping interests and from the United States inspection service at a meeting in Buffalo, and its defeat was urged by these three bodies. In this discussion it developed that the bill paid no regard to the well-established boiler practice of western rivers and lakes and that some of the rules proposed would tie up, until they could be repealed, a large proportion of the interior and coastwise shipping of the country. In the discussion all expressed the most heartfelt regret that these matters of detail should make it necessary to oppose and defeat a measure, the inception and spirit of which they warmly applauded, and entertained the hope that at some future time the very bodies then opposing it might obtain the benefit of the wise counsel and strong influence of Senator Frye in introducing and passing a comprehensive bill, embodying the experience and knowledge of all concerned. Several meetings of individual members of the A. B. M. A. with the board of supervising inspectors at Washington did indeed result in occasional modifications of rules which worked hardship. But the conviction grew that a complete revision of the law had become a necessity.

On Aug. 13, 1901, at the thirteenth annual convention, Mr. Rees of Pittsburgh brought in a protest against several onerous rules, and on motion the whole matter was referred to the committee on uniform boiler specifications, which was increased to nine members by adding several men specially versed in marine boiler building. This committee met in New York Nov. 12, 1901, and with the board of supervising inspectors in Washington Jan. 21, 1902. In this meeting the limit of the power of the board to meet the requirements of modern practice was clearly defined, and while some corrections of previous rulings were granted, it became clear that the committee could only hope for success by urging the entire revision of the law itself. A full canvass of the membership during 1902 showed a very general appreciation of the necessity of this movement and willingness to co-operate in it. After the necessary preparatory work had been done, at a meeting held Dec. 18, 1902, in New York, the action before indicated was taken.

THE INSPECTION SERVICE.

Steamboat inspection service dates its beginning from the act of 1852, which simply prescribed that all makers of iron boiler plate must stamp each plate with their names, place of manufacture and a letter to indicate whether charcoal or puddled iron was used in making the plate. There being no penalty the reputation of the maker was the only safeguard to the purchaser. In 1872 another law was passed, according to which the stamp must give the name of the maker, place of manufacture and the tensile strength, and a penalty of \$2,000 and two years' imprisonment was provided to guard against fraudulent stamping. In 1877 Jas. A. Dumont was appointed supervising inspector-general and took further action under the law. First, he placed testing machines in the ten districts, and on Nov. 22, 1877, directed inspectors to subject all plates of boiler iron to actual test before the boilers are begun, and carefully ascertain the homogeneousness and toughness of material "where plates are stamped over 50,000 lbs. tensile strength." By request, in January, 1878, the principal boiler-plate manufacturers of the United States met and advised with the board of supervising inspectors on matters pertaining to testing, etc., and the conclusions were embodied in the rules. Naturally a marked improvement in the materials and workmanship resulted from this closer inspection, and in 1882 Mr. Chas. Huston, the veteran plate maker (in whose mill the first boiler plate ever made in the United States was rolled in 1810), wrote to the secretary of the treasury that "the present rules and regulations are probably the best that are to be found in any nation." That Mr. Huston had good reasons for this opinion is shown by the statistics of the service.

From 1858 to 1860 there are recorded 721 deaths by accident on 1,687 steamers. This was at the rate of one life lost per annum for 2,34 steamers, or for 138,700 passengers. In the decade from 1868 to 1878 we have 365 deaths on 3,645 vessels, being one life per annum for every ten steamers and for 821,600 passengers. In the next decade, ending with 1888, we have 213 deaths on 5,344 vessels, or one life for every twenty-five steamers and for 2,347,400 passengers. This shows that by intelligent inspection travel on steamboats was six times safer in the second and seventeen times safer in the third decade than it had been in the first. In the year 1901, 13,551 boilers on 9,253 vessels were inspected by the service, and they reported 150 passengers lost out of a total of 306,353,522, making one passenger lost for every 61.7 steamers, or one out of every 2,042,357. But as we are concerned with boilers only in this discussion, we find that there was only one passenger killed out of 13,925,160 by steam escaping through

* From the Journal of the American Society of Naval Engineers.

explosion or rupture of any kind whatsoever. Only eleven boilers caused damage, either by explosion or by partial rupture of parts of the boilers or connecting pipes, *i. e.*, only one out of 1,232 boilers caused serious trouble. For the whole United States there are reported during 1901, 423 explosions or ruptures; of these 89½ per cent were due to land boilers, 9.2 per cent to locomotive boilers, and only 1.3 per cent to boilers used on boats. These few figures show the immense value of an intelligent and conscientious inspection service. It must be remembered that this service was rendered under laws and rules which have become antiquated and ill-adapted to the new conditions created by the great improvements in materials for boiler work, and in methods, machinery and manufacture, as well as by a radical change in marine service, notably higher pressures of steam and the necessity for higher furnace temperatures and more rapid and economical evaporation.

NECESSITY OF REVISION.

The question may be asked: If the inspection service shows such good results under the old laws, why is a change demanded? One little set of figures by way of illustration: In 1901 there were 1,525 iron boilers, 1,352 coil and pipe boilers and 10,674 steel boilers inspected. But as we have seen, the laws and rules under which these inspections must be held were built up originally on the conditions which existed in 1877, when the leading plate manufacturers of the United States met together to discuss the qualities of boiler iron. The figures just quoted show that there are seven times as many steel boilers in use now as iron boilers, and nearly as many coil and pipe boilers as the latter. These changes in materials and construction and in fundamental design cannot be intelligently and honestly met by rulings based on laws passed when neither steel plate nor pipe boilers were thought of. A critical examination of the rules shows many inconsistencies and contradictions, and there are some matters in which the long-established practice and ruling of the board has resulted in evasion, if not violation, of the meaning of the law. Section No. 4,433 says in plain language that the working pressure shall not produce a strain to exceed one-sixth of the tensile strength of the material for single-riveted, nor one-fifth of the tensile strength for double-riveted seams. Until two years ago no rules for proportioning rivet seams were ever promulgated. But in practice the above provision of the law was construed as though it applied to the full metal, the seam value being ignored. The formulas for joints, taken from the British board of trade, tabulated by Traill, were adopted by the board in January, 1901. Applying these new rules to the table of pressures published by the board, gives us factors of safety in the net metal of only 3.5 in $\frac{3}{8}$ -in. steel and 3.29 in $\frac{3}{4}$ -in. steel. In the absence of any provision of the law the board has no power to give builders the benefit of the greater seam values attained in the triple-riveted lap or double butt-strapped joints. The law knows nothing beyond the double-riveted lap.

When the service was first established Congress evidently had in mind steamboats, and the problems presented by the great steamships of the Atlantic and Pacific, as well as those on our great lakes, were not then so prominent. By building boilers of small diameter, generally 42 in. and 44 in. for the high-pressure boats on the great western rivers, and of larger diameter for the low-pressure in use on the eastern lake, river and coastwise steamers, these specific provisions, all made for thin plates, could be applied with but slight modification. But, since pressures have risen to 200 lbs. and over for triple and quadruple-expansion engines, and since the advent of the internally-fired Scotch boiler, of pipe boilers and of steel plate running up to and above 70,000 lbs. tensile strength, this is no longer possible. The best modern practice on land, and that of the navy department on salt water, meet these differences because untrammeled by antiquated rules. To enable the steamboat inspection service to do this, radical changes in the law are necessary. The under-fired Mississippi river boiler must be made of ductile and very thin plates to stand the fierce fire on one side and the ever-present mud on the other. In the Scotch marine boiler the outer shell untouched by fire presents simply a static problem, and must be constructed of plates of high tensile strength. Steel manufacturers are now prepared to meet every condition presented by boiler problems; but the chemical composition of those various alloys of iron which we have agreed to call steel must vary according to different demands for tensile strength, ductility, etc.

Another feature of the practice of the service requires amendment. Rules may be changed each year only during the January meeting of the board of supervising inspectors. These officials, when not chosen simply for political reasons, have been promoted either from the inspectors of hulls or the inspectors of boilers. It thus frequently happens that important matters connected with steam boilers and machinery have to be passed on by a board on which, perhaps, only three or four members are specially posted on them. The matters presented often come up suddenly, leaving no time for members of the board to make special preparatory study. They would be more than human did they not frequently fall into grave error, and, of course, only the party specially interested in the change will be heard, as others, whose interests may be as great, though different, cannot be notified in time to be present. Thus, some twenty years ago a certain theory was advanced in regard to inequalities of pressure which led to legislation demanding that steam-drum legs must have 1 sq. in. of area for every 2 sq. ft. of "effective" heating surface. What "effective" heating surface means would be a problem for lawyers, as there is no definition extant in engi-

neering practice. Of course, to base such area on heating surface at all is faulty; for we have different types of marine boilers in this country, some whose hourly work is the evaporation of 3 lbs. and others that of 20 lbs. per square ft. of heating surface—the latter, of course, very "effective." The grate area, draft and kind of coal used are, of course, the true determining factors for the size of steam openings. As far back as 1886 the hardship of this particular law was made so manifest to the board that they recommended a change to 1 sq. in. opening for every 4 sq. ft. of heating surface; but there the matter dropped, and the old rule remains.

There is another rule which works great hardship, namely, that "materials for repairs must be tested in the district where used." Following is a case illustrating the hardship of this rule: A boiler originally built in Pittsburg was to be repaired in a southern city. Material of exactly the required quality could be obtained in Pittsburg and verified by the local inspector there, and the plate prepared according to the blue prints of the original builder. But the rule prevented this, and the boat was tied up for a long time in consequence. There is no sound reason why boiler steel tested at the mill where manufactured and properly inspected and stamped by a United States inspector should not be used in any port or river town of the United States. The practice of the navy in this matter presents a good and sufficient precedent.

Several peculiar cases have come up under the provision of section No. 4,433, that other parts of boilers shall correspond in strength to the allowances made for the shell. For instance, a boiler manufacturer arranges the braces for his boiler for the required steam pressure, say 100 lbs. But in order to increase the life of the shell and to provide against deterioration by pitting and rusting he makes the shell 1-16 in. or more thicker than the law requires. A ruling is at once applied that now he must increase the strength of his bracing so that it will correspond to the pressure which by the rules the thicker shell may be allowed to carry. Here is adherence to the "letter that killeth" with a vengeance, and it frequently works great hardship.

The necessity of some rational system of proportioning rivet seams has been so fully impressed on the board that the adoption of Traill's rules seems to have been the result of the energy of despair. But they do not work out with modern American practice. The many tests made at Watertown have shown us that it is not safe to figure on more than 40,000 lbs. rivet shear, and further that where the rivet strength somewhat exceeds the tensile strength of the standing metal the latter shows from 4,000 to 5,000 lbs. per square inch better than in the test piece. The rules as printed in the appendix fix arbitrarily the ratio of the area of the net plate to rivet section as .8214. The inevitable result is that in such a joint, steel plate of 56,000 lbs. tensile strength requires 46,000 lbs. rivet shear, and plate of 65,000 lbs. tensile strength, a not at all unusual strength, requires 53,393 lbs. of rivet shear. Apply this to "table of pressures allowable on boilers built since Feb. 28, 1872," and you find that the factor of safety in the net plate runs over the scale as follows: 3.5; 3.46; 3.37; 3.3; 3.29; and the factor of safety in the rivets, based on 40,000 lbs. shearing strength, runs: 2.9; 2.6; 2.53; 2.49 and 2.47 on plate varying from $\frac{3}{8}$ in. to 1 in. in thickness. These few examples (and many more could be cited) show conclusively that the good results obtained by the inspection service are due to the conscientious work of its members and of the builders of boilers, and have been obtained not in consequence of, but in spite of laws and rules under which they worked. There are other points, showing the insufficiency of the law, which might be cited; rules which were sound when passed and are sound today for the limits then existing, but which may tend to hardship and danger in the larger limits set by modern practice. For instance, safety valves of sufficient area for 50 lbs. become dangerous by their very size at 200 lbs.

Finally an entire rearrangement of the sections of the law is imperative to avoid trouble, and actual conflicts in statements must be eliminated. Questions of design should come first, next materials and their inspection; then test, factors of safety, methods of workmanship, and finally matters of location, connections and accessories. An entire revision at the hands of competent experts seems the only solution of the question; and this committee should consult all the main interests affected, namely, the inspection service, the navy revenue cutter service, naval architects, marine engineers, boiler manufacturers, plate manufacturers and ship owners. The requirements and necessities of each of these great interests harmonized in the full knowledge of conditions and problems, which a joint discussion by these experts would evolve, will give us a law and an inspection service commensurate with the vast interests of the foremost manufacturing people of the world, and one which will stimulate in place of repressing the development of that maritime superiority, the attainment of which has become a recognized necessity.

Bids were opened at the navy department Wednesday of this week for the construction of the Minnesota, Vermont and Kansas, the three 16,000-ton battleships authorized by the last congress, each to cost not exceeding \$4,212,000. These battleships will be the most powerful vessels of the American navy. They will have a required speed of 18 knots, a displacement of 16,000 tons, a main battery of four 12-in., eight 8-in. and twelve 7-in. breech loading rifles, and a second battery of twenty 3-in. 14-pounder rapid fire guns, twelve 3-pounder semi-automatic guns, six 1-pounder automatic guns, two 1-pounder semi-automatic guns, two 3-in. field pieces, two machine guns and six automatic guns.

FIRE AND VERMIN ON BOARD SHIP.

By Geo. W. Ramage.

The scourge of fire and plague of rats, mice and insects on shipboard have for ages been prolific sources of anxiety and loss to the ship owner and mariner. This anxiety and loss is also shared in a marked degree by shippers and by the marine insurance interests, who stand to lose with the ship owners from the ravages of flame and vermin. What may be news to the average individual is the fact that the destruction of life and property directly traceable to rats alone, that are harbored aboard ships, exceeds that caused by fire, as their ravages are continuous, while thanks to the watchful care exercised at the present day by those responsible for the safety of a ship and her cargo, a disastrous fire at sea occurs but occasionally. And yet, occasionally is far too often, as outside of any consideration of property loss, such a calamity is too pregnant with peril to human life to be contemplated with any degree of equanimity. Only those who have been participants in such a disaster can fully realize the unutterable horror of a fire at sea, and they even cannot adequately describe the horrible fear and feeling of utter helplessness that seizes upon them when brought face to face with the realization that their only place of refuge on the expanse of water is doomed to destruction. Persons who have passed through such an ordeal and escaped with their lives can fully appreciate the boon to humanity of any invention or discovery that will even lessen, let alone eliminate, the danger from fire on shipboard.

A prolific source of fire at sea is spontaneous combustion, the stealthy germ of which is ever present in a variety of merchandise, such as cotton, coal, oils, seeds and fibres, which may smolder for days unseen only awaiting favorable conditions to burst forth into uncontrollable flame destroying property and human life.

But, while the ravages of fire at sea are more dreaded by mankind than that of vermin, because the effects are more startling and therefore seem more terrible and devastating, the fact remains that the latter, as proven by scientific investigation, is even more of a menace to life and property than the former. Especially is the presence of rats on shipboard to be feared since it has been demonstrated that the dreaded bubonic plague and other contagious diseases are carried from one country to another by this rodent, transported in the holds of ships. Before this question was understood plagues like the bubonic, cholera, etc., which seemed to leap across oceans as if on the wings of the wind, were considered as visitations of Providence in punishment for man's misdoings. But, thanks to scientific research, this superstition, like many another gone before, has fallen from its pedestal. In truth it has fallen from the Omnipotent Throne of Providence and landed in a loathsome rat hole, greatly to man's advantage; for, while the ways of Providence are past finding out those of the rat are within human comprehension and may be reckoned with. In the days when Providence was held accountable for all the evils for which man in his ignorance could not account there was a superstition rife among sailors—which still lingers among the more ignorant—that a ship that did not harbor rats aboard was unseaworthy and hence unsafe to ship on. The fact is, rats, which are endowed by nature with exceeding keen instinct, approaching reason, having access to all parts of a ship's hold were the first to discover any weak part or leak therein, and scenting danger sought safety in flight or were starved out, thus begetting the popular superstition mentioned.

But in these days of enlightenment the mariner is as anxious as the landlubber to dispense with the rat's company, and even more so, since he has learned that the rodent is a pest breeder and distributor, besides being a costly passenger through the havoc wrought to cargo.

On this score Dr. A. Loir, who is a nephew and worthy follower of the late celebrated Louis Pasteur, in discussing damage done by rats on shipboard before the section of hygiene, Colonial Congress of Paris, April 11, 1903, said: "Rats are not only germ vehicles, as aptly expressed by M. Le Dantec, but veritable scourges from the point of view of the losses they inflict on cargoes of vessels. It is calculated that a rat consumes in one day about 14 centimes (about 3 cts.) worth of merchandise. On board vessels which carry coffee the damage done by rats often amounts to 8,000 or 10,000 francs on a single cargo. In Denmark the annual losses caused by these pests are estimated at 15,000,000 francs (\$3,000,000), which represents a tax of 6 francs (\$1.20) per annum on each inhabitant."

It is also a well-demonstrated fact that the rodent is nothing loath when hungry in attacking man, and passengers on ocean liners have been known to be attacked in their berths at night by them.

But while fire and rats aboard ship are to be dreaded, the lesser vermin, composed of creeping and flying insects that find their way on board, are to be seriously considered, as they are a constant menace to comfort, health and life. This is particularly true in regard to the pestiferous mosquito and the loathsome bedbug, all too often found pre-empting ships' cabins and berths, and eagerly awaiting human victims. As regards the bedbug: It may not be generally known that death often lurks in the bite of this pestilence that walketh in darkness, but such has been proven to be a fact. A case in point: A French physician attended a patient who died of consumption. The bed on which the patient died was afterwards occupied by a person in good health who soon developed consumption and died. Again the bed

was occupied by still another healthy person and he soon followed his two predecessors, being carried off by the same disease. Then the physician began a thorough investigation in search of a cause for tuberculosis contagion, to which he ascribed the deaths of the two last victims. This he found to be bedbugs, with which the bed which the three patients had occupied was infested, the vermin having conveyed the inoculating virus of the dread disease from one victim to another. Thus the cause of many a contagious disease, which heretofore has seemed a mystery, and, like all other death laden mysteries, has been laid to a "visitation of Providence," may be traced to its source and a preventive applied. As to this nocturnal pest, too much care cannot and should not be spared to eradicate it from sleeping apartments, especially where such apartments are constantly subject to change of occupants.

The mosquito, hitherto rated as simply an annoying nuisance, is now known to be a most dangerous enemy to man's health as well as happiness. While this pest is frail of body he is all powerful in spreading malarial contagion, and being native to all parts of the earth he may be rated as the most universal pest to be found on the globe. None are exempt from the attacks of this fever-germ bearer, as he is no respecter of persons, attacking the just and the unjust, the cleanly and uncleanly, varying his virus according to latitude, from the germ of ordinary malarial fever of the temperate zone to that of the malignant "Yellow Jack" of the tropics. No better proof of his contagion-spreading qualities is needed than the results of the late tests in Cuba, where by experiments necessitating the sacrifice of human lives, it was demonstrated that this noxious insect inoculated human beings with yellow fever and is the chief cause of the spread of that dreaded disease.

Other vermin that often infect ships and their cargoes and prove destructive to property, and a pest in many ways, might be enumerated, such as cockroaches, ants, weevils, etc., but enough have been mentioned to show that an efficient remedy for these evils has long been needed. Many methods have been tried in the past to rid vessels of the pests complained of, one being carbonic acid gas, which has proved to be too dangerous for general use, as giving off no odor it may be unconsciously inhaled by man in deadly quantity, the victim being unaware of danger until seized by death, a case being cited by French authorities where three men were killed by its use in fumigating a ship.

The writer has lately been investigating the subject of preventives of the evils complained of, which are of vital importance, not only to the shipping interests of the world, but to the whole human race, and among other methods used for destroying vermin, fumigating, disinfecting and suppressing fire on shipboard, has been making inquiry into the value of the Clayton gas system, which is winning its way into great favor in Europe, having been adopted by Great Britain, France and Germany, British India, Cape Colony, Natal, Rhodesia, Egypt, French Soudan, Australia and Brazil and is now being introduced into this country. This gas is the discovery of Mr. Thomas A. Clayton, who, born in Scotland, came to America at an early age and became a citizen of the United States. In 1898, while confined to his bed in Philadelphia from an accident, he read an account of a disastrous attempt to fumigate a ship by the old-style method of burning sulphur in an open kettle, where the kettle was accidentally upset and the burning sulphur set fire to the vessel destroying it. This set him to work on a plan for using sulphur for such a purpose without any attendant danger. The result of his studies and experiments was the Clayton gas machine, or apparatus, in the construction of which, it would appear, the inventor builded better than he knew. Although his first apparatus was crude, it demonstrated its ability to manufacture and diffuse a gas consisting principally of sulphur dioxide, but also containing the higher oxides of sulphur, giving it strong toxic and penetrating properties. This product is now known as Clayton gas, which, before its properties were discovered by Mr. Clayton, was unknown to science.

The method of generating this gas is extremely simple. A generator is charged with sulphur, which, when gas is wanted, is ignited with a quick-burning kindling, and the sulphur, by its own combustion, generating a temperature of over 1,000 degrees Fah., produces the gas; which before being used, is quickly cooled down to a temperature of from 85 to 125 degrees Fah., and by means of a blower, which is part of the apparatus, is diffused through metal pipes, or rubber hose, to any desired point.

It has been found by tests carried on by experts that this gas is the most powerful and efficient, as well as the safest, agent known to science for extinguishing fire, destroying vermin and disease germs and the preservation of perishable products on board ship. Its penetrating properties is one of its marked peculiarities, as will be herein shown, while the ease and cheapness of its production is greatly in its favor. Another advantage claimed for it over other known methods for exterminating rats and other vermin is that at the first sniff of its pungent odor the vermin leave their hiding places and seek the open in quest of fresh air, where they are soon asphyxiated, and thus they may be easily gathered up and removed after the operation.

Another favorable feature is the safety in its use, a good illustration of which was given at the first trial made at Dunkirk, France, of the gas for fumigating and disinfecting purposes, on the steamer La Marguerite. In this instance, after due precaution had been taken to see that no person remained within, the gas was turned into the crew's quarters through a door left slightly ajar to admit the rubber hose through which the gas was con-

vayed. A moment after the gas began penetrating the quarters the operators were astonished to see a terrified man rush from the quarters through the door which had been left ajar, who was recognized as a sailor who had formerly belonged to the ship, but had been discharged. It transpired that he had come on board in an intoxicated condition and gone to bed in his old quarters, where he had fallen into a drunken stupor, and entirely covered with blankets the precautions taken to clear the quarters had failed to arouse him. The strong odor of the gas suddenly awakened and sobered him when he lost no time in getting to the open air and safety. In this case had carbonic anhydride been used instead of sulphurous anhydride, this man, even had he awokened, would have died before he could have reached the open air, or shortly after.

As to its efficiency as a vermin exterminator the following may be cited: In a recent disinfecting by this gas of an English steamer at London, which had been in service but a year, there were 1,660 rats and innumerable lesser vermin gathered up after the operation. As the result of a similar operation on a British India vessel 1,386 rats and twenty-eight buckets of insects were obtained. Such tales might well be deemed to have their inception in the fo'castle, but for the proof at hand as to their truth.

A report to the minister of the interior of France, made by a committee appointed by that official to inspect and report on various processes for the destruction of rats and disinfection on board vessels, the committee consisting of Professor Proust, inspector general of sanitary service, and Dr. Paul Faivre, inspector of health service in the ports, contains this conclusion after a recount of details of the investigation: "To sum up, from the triple point of view of its force of action, the facility and the security of its employment, we find that the Clayton gas is uncontestedly superior to sulphurous acid, produced in the open air, and to carbonic acid gas. This gas appears to us the most efficacious process which we know of for the destruction of rats and the disinfection of merchandise on board ship."

Regarding the efficiency of this gas as a mosquito annihilator the following is noted from a pamphlet issued by the French minister of the colonies entitled "The Practical Battle Against Malaria." Precaution against mosquitoes is a question of supreme importance in maritime sanitary measures, and we think it our duty to reproduce the following letter which forms an interesting example on the subject:

London, Feb. 27, 1903.

Sir:—I learn that you desire to know the results observed from the use of Clayton gas for destroying mosquitoes on board ship. I am happy to affirm that after fumigating the cabins of the S. S. Ashmore, which I used to command, on a voyage to Galveston, not only were the mosquitoes present destroyed, but the vessel remained absolutely free from the pests during the whole of our stay in Galveston, whilst the crew of other boats in the port which had not been fumigated were tormented by the mosquitoes every night. Nothing was damaged, neither our personal effects nor our provisions. I used the gas several times while commanding the Ashmore. My predecessor on the Abergeldie, which I command at present, also used it, for this steamer has likewise the Clayton apparatus on board and we have successfully employed it to rid us of all sorts of insects.

(Signed)

WILLIAM KEITH,
Captain S. S. Abergeldie.

The following letter from Messrs. Adam Bros., Ltd., Exchange building, Newcastle-on-Tyne, also of London and Aberdeen, written in answer to an inquiry, bears further testimony on the subject:

Newcastle-on-Tyne, Dec. 24, 1902.

Gentlemen:—In answer to your inquiry as to the results obtained from the use of the Clayton apparatus on board our steamers, we learn that it has been used so far only for getting rid of vermin, especially mosquitoes and bedbugs. Our captains advise us that after clearing their cabins of mosquitoes by means of the gas, these pests do not return for some considerable time, so that only one disinfection was sufficient to keep the cabins clear of them for days, while the crews of other ships lying alongside were devoured every night. We think this alone justifies the recommendation of the Clayton apparatus.

(Signed.)

ADAM BROTHERS, LTD.,
J. B. Adam, Director.

The owners of the S. S. Aberlour, lately fitted with a Clayton fire extinguishing and disinfecting machine, have this to say of its use: "The chief officer of the Aberlour reported on the machine on board this vessel, stating that they loaded a parcel of 800 tons of bone meal in No. 2 hold. After they got to sea an innumerable quantity of maggots were found coming up the ventilators. They immediately turned the gas into the hold with the result that all the maggots were killed and on discharging not one pound of cargo was found damaged. This of itself shows the usefulness of the Clayton machine as the chief officer states that there was a constant stream of maggots coming up the ventilators, and that if they had not had the machine on board he considers everything in the cabins, including clothing and effects, would have been destroyed, to say nothing of the discomfort that would have been experienced by those on board."

The French minister of the colonies in official instructions communicated to the governors-general and governors of colonies and to the commissary-general of the government in French Congo, issued in April of the present year, says: "It appears to

us indispensable that our quarantine stations should be furnished with Clayton machines as quickly as possible, seeing that the process destroys with certainty all rats and such insects as fleas, bedbugs, cockroaches, etc., without perceptibly affecting the most delicate kinds of merchandise, such as hides and skins, cereals, meats, fruits, and without in the least injuring metallic objects, besides rendering inoffensive articles infected with the microbes of typhoid fever, cholera, or bubonic plague. In this way our colonial ports will be safeguarded against all infectious maladies and vessels will be freed from the long detentions at quarantine so prejudicial to commerce."

This gas has also been found as useful on land as aboard ship, as the following extract from an article in the Bulawayo Chronicle of April 11, 1903 published at Bulawayo, Africa, captioned "White Ant Destruction," testifies: "Since the arrival in Bulawayo of the Clayton fumigating machine several interesting experiments have been carried out with the object of destroying the white ant pest, which show conclusively that the machine performs all that the makers claim for it. Within the last few days an experiment was made at a house in the suburbs lately used by Dr. Loir as the local Pasteur institute. The white ants at this place have wrought considerable havoc on the verandah by eating away the boarding. One of the ventilators on the verandah was taken out and the pipe through which the gas is forced was inserted in its place. Then the machine was put in operation. The machine was allowed to run during the morning and volumes of gas were forced under the stoop. In the afternoon one of the boards on the verandah was removed and on inspection very large numbers of white ants were found dead. In order to better understand the force with which the gas is pumped into the earth it must be stated that the fumes penetrated the entire length of the verandah, which runs along the front and two sides of the house. Further, it found its way into the rooms (nine in all), which, needless to add, were thoroughly disinfected. It was also discovered that under the verandah the ants had built a kind of tunnel of earth in which they probably carry on their work of destruction, and it is worthy of note that the gas permeated through the very miniature holes in the tunnel. On removing quantities of this tunnel, or earthwork arrangement, numbers of dead ants were found in the interior, where they had been working. This experiment conclusively proves that the gas not only penetrates the earth for a considerable distance, but kills all insect life with which it comes into contact. So far the experiments go to show that the machine, in all probability, will be a great boon to this country, and the cost of generating the gas is so trifling that the machine should be in demand when all its advantages are fully made known. In the event of the machine being used to disinfect a room or house it is interesting to learn that this can be done in about ten minutes' time with very little inconvenience, on account of the 'blower' of the machine being easily disconnected from the gas generator when a supply of fresh air can be pumped into the room, driving out the fumes either through an open door or window."

Since the above was written tests have been made on white ant hills in the Bulawayo park with the most gratifying results, the gas penetrating the earth and killing the ants.

In late experiments with Clayton gas, made by order of the United States secretary of the treasury, and carried out under the supervision of Messrs. Robert S. Rodie, John W. Oast and Capt. James Stone, supervising inspectors of steam vessels for the districts of New York, Norfolk and Cleveland, respectively, the following satisfactory tests were made:

A pile of wood, saturated with kerosene, was set on fire and when the blaze was under full headway the gas was turned on and extinguished it in two minutes. In experiments with rats it was found that they lasted the same length of time as fire when subjected to the gas.

A quantity of tea, placed in a closed chamber and subjected to the gas for sixty-seven hours, was found when taken out not to have undergone any change whatever as to its quality and taste, as attested by expert tea tasters. In fact the laugh was gotten on one taster by giving him a sample of the same tea that had not been subjected to the gas, after sampling which he said he thought he detected a slight taste of sulphur about it.

A variety of colored fabrics of delicate material were also subjected to the gas for the same length of time as the tea without affecting either texture or coloring in the slightest degree. But perhaps the severest test to which it was put was in extinguishing fire in the heart of a bale of cotton, which showed its great penetrating properties. In this test a bale of compressed cotton was used, into which a hole 3 in. in diameter was drilled for a distance of 15 in., into which an iron bar 1½ in. in diameter and 11 in. long, which had been heated to a white heat, was dropped and the opening thoroughly tamped by means of cold chisel and sledge hammer. The bale was then subjected to the gas and when opened after the operation was found to be sound except for an inch or such a matter, immediately surrounding the iron, which was charred. The experts had expressed the opinion at the beginning of this test that the best they expected the gas to do was to save a shell of the cotton bale.

In fact, the tests made on this occasion were thorough and exhaustive, lasting four days, and that they were satisfactory to the officials is shown in their report to the secretary of the treasury, allusion to which was made a short time ago in these columns.

Besides the endorsement and adoption by governments of the Clayton gas for use at quarantine stations, etc., the following European steamship companies, among others, have installed the

apparatus on their ships: North German Lloyd Steamship Co., New Zealand Shipping Co., Union Steamship Co. of New Zealand, Century Shipping Co., Adam Steamship Co., R. Hughes-Jones & Co., James Boyd, Raumo Nya Skepporederi Aktiebolag, Harris & Dixon, and E. F. & W. Roberts. The Standard Oil Co., after being thoroughly satisfied of its value—as is the custom of this corporation before adopting new methods or measures—has ordered a Clayton apparatus placed on its ship Astral. The Pacific Mail Steamship Co., fully assured as to its merits, has ordered the apparatus placed on the two steamers now building for the company at the works of the New York Ship Building Co., Camden, N. J., while others are soon to follow.

Perhaps the strangest thing connected with the adoption of the Clayton gas method by governments, steamship companies, warehousemen, etc., is that, while it was discovered in America, Europeans have been the first to realize its merits and advantages over anything heretofore known—both as to execution and economy of operation—and put it to practical use. This surely does not speak very highly for our boasted progressiveness. But now that the method has been tested in all manner of ways, for all purposes for which a fire extinguisher, disinfectant and fumigator is used on board ship or at quarantine stations, etc., and has shown its worth in actual practice, America is waking up to its value, as shown by its adoption by the companies named. That other ship owners and other departments of the United States government are bound to follow in its adoption goes without saying, as it appeals directly to all commercial and sanitary interests, for it not only protects life and property, but saves money to ship owner and shipper in the way of substantial reduction of rates by insurance companies on vessels wherein the apparatus is installed. For use at quarantine stations its advantages over the present method of superheated steam for disinfecting purposes are apparent at a glance. The first cost of installation is much less, as is that of its operation, while articles needing disinfecting do not have to be handled by the operators but may be left in a room, or any enclosure, that can be reached by a rubber hose.

The United States government will no doubt adopt the Clayton method as soon as existing laws—which were framed long before Clayton gas was thought of—can be amended. But our officials will need to move early in the matter or what we consider the slow-going countries of South America will be benefitting from its use while we are still dallying. As already noted, Brazil has adopted it, and note the following from Peru:

Dr. M. O. Tamayo, the eminent bacteriologist of Peru, was lately sent by his government on a tour of inspection to investigate the various methods in use by different governments for disinfecting purposes, with the view of finding a sure preventative for the spread of bubonic plague, cholera and other contagions. In his quest he first went to Europe and recently came to New York where he thoroughly investigated the merits of Clayton gas,

with which he had become somewhat acquainted while abroad. His investigations were so satisfactory that when leaving for his home last week he signified his intention of recommending the purchase and installation of several apparatuses by his government.

The discovery of this gas may certainly be rated as one of the triumphs of science for the preservation of life and property. It is quite evident that there cannot longer remain any excuse for a ship not being kept as free from rats and insects and in as perfect sanitary condition as the best kept private residence in the land, not to mention immunity from fire. Ship owners should recognize the fact that the safer and cleaner the ship the greater will be its patronage, both as to merchandise and human freight.

The Clayton gas apparatus is now manufactured in Great Britain by the Clayton Fire Extinguishing & Ventilating Co., Ltd., 22 Craven street, Northumberland avenue, London, W. C.; in France by the Compagnie du Gaz Clayton, 36 Rue Taitbout, Paris; in Germany by the Norddeutscher Maschinen & Armaturen Fabrik, Bremen, which concern is sole agent for Germany and Denmark; in Australia by the Clayton Fumigating & Fire Extinguishing Co. of Australia, Ltd., Sydney, N. S. W., and in the United States and Canada by the Clayton Fire Extinguishing & Disinfecting Co., 11 Broadway, New York. Directors of the latter company known to us here, are all of high standing and business probity in the commercial world. They are: B. Shepard, Captain B. H. Buckingham, Moses Taylor, Walter Scranton, Cornelius Vanderbilt, Francis C. Bishop and Thomas A. Clayton, the first three being president, vice-president, and secretary and treasurer, respectively, of the company, while Mr. J. H. Clayton, a gentleman thoroughly versed in all the details of the business, is general manager.

Colonists and homeseekers' excursion rates to west, northwest and southwest by way of the Nickel Plate road. Call on nearest agent, or E. A. Akers, C. P. & T. A., Cleveland, O.

69 June 12

Tugboat for Sale.

For sale at sacrifice. Tugboat 75 ft. 5 in. length; breadth, 18 ft. 5 in.; depth, 7 ft. 5 in.; gross tonnage, 54. Built by Standard Oil Co. Has large fire and wrecking pump, 14 in. cylinder. Most powerful boat of size in New York harbor. Ready for immediate service. All necessary fixtures and fittings. Last inspection September, 1902. M. F. Driscoll & Co., 11 Broadway, New York. May 28.

BELLEVILLE WATER-TUBE BOILERS

NOW IN USE (FEBRUARY, 1903)

On Board Sea-going Vessels, NOT INCLUDING New Installations Building or Erecting.

French Navy	-	-	-	-	-	276,460 H. P.
English Royal Navy	-	-	-	-	-	849,300 "
Russian Imperial Navy	-	-	-	-	-	193,900 "
Japanese Imperial Navy	-	-	-	-	-	122,700 "
Austrian Imperial Navy	-	-	-	-	-	32,900 "
Italian Royal Navy	-	-	-	-	-	13,500 "
Chilian Navy	-	-	-	-	-	26,500 "
Argentine Navy	-	-	-	-	-	13,000 "
The "Messageries Maritimes" Company	-	-	-	-	-	87,600 "
Chemins de fer de l'Ouest: (The French Western Railway Co.)	Steamships					
plying between Dieppe and Newhaven						18,500 "
Total Horse Power of Boilers in Use	-	-	-	-	-	1,634,360

WORKS: Ateliers et Chantiers de l'Ermitage, at Saint-Denis (Seine), France.

TELEGRAPHIC ADDRESS: Belleville, Saint-Denis-Sur-Seine.

UNIFORMITY IN STEERING.

At the special meeting of the supervising inspectors of steam vessels in Washington this week the old question of uniformity in the steering of steam vessels on the lakes will again be taken up and it is probable that a ruling will be made on that score. No doubt a great many accidents have occurred on account of the two methods, known as crossed and straight chains, which are in practice on the lakes. In the so-called straight-chain vessels the wheel in the pilot house is rolled in the direction opposite the word of command but in the direction in which the ship's head is to turn; with the crossed chains the reverse is the case. Of course a wheelman going from a straight-chain vessel to one of crossed chains or vice versa is very liable to make mistakes and such mistakes prove disastrous under critical circumstances. This is the argument in favor of uniformity. Then, too, there is complaint from the ship builders who say they are often subjected to annoyance on account of the two methods, with aggravation of the trouble in cases where indicators are used. "Will the indicator on the pilot house stand point forward and represent an imaginary tiller on the forward side of the rudder stock or point aft and represent the rudder blade?" This is one of the ship builder's questions. In the case of the passenger steamer Tionesta, built recently at Detroit, the chains were changed three times while the builders were getting ready to turn her over to her owners.

Time was, and not so very long ago at that, when a launch on the great lakes was made the occasion for chartering special trains, purchasing huge armfuls of flowers, holding a big banquet in the mold loft, delivering speeches galore and playing gallant to the fluttering thing whose duty it was to say "I christen thee Edward Smith No. 2." A launch was a social event to which a variety of persons looked forward anxiously for weeks. But those days have gone by. The multiplication of vessels dropping off the stocks every other week has made the business common. Vessels latterly have been dismissed with pretty scant ceremony. On one occasion lately a girl stenographer was requisitioned for the occasion; but it has remained for the past week to send them into the world without any sponsor whatever. The George C. Howe, one of the Wolvin canalers, slid off the stocks at South

Chicago without even so much as a fair typewriter to do the steamer honor. Almost at the same time the steamer James H. Reed, building for the Provident Steamship Co. at Detroit, went by the self same road.

A map showing the entire water front of the city of Buffalo has just been published by Mr. Henry P. Jones of 855 Niagara street, Buffalo. It is necessarily very large, as it is made to a scale that brings out details along the whole stretch of the city's shore-line and harbor. It is compiled from the latest government, state and city surveys. The scale is 400 ft. to the inch. The territory covered is from the Lackawanna steel plant and city line on the south to O'Neil street and city line on the north and from a quarter of a mile to a mile inland. Depth of water in Lake Erie, Niagara river, Black Rock harbor, Erie basin, Buffalo harbor, Buffalo river and the city ship-canal are all shown as are also name, location and capacity of all grain elevators, principal manufactures, railroad connections, property owners, harbor lines, the proposed ship-canal through Black Rock harbor, fluctuation in level of Lake Erie during past five years, etc. The chart is undoubtedly the best thing of its kind ever published on the lakes. It is on cloth and sells at \$7. It may be had from the Marine Review.

The steamer New York of the Hudson River Day Line made the run between New York and Poughkeepsie last week in 3 hours, 2 minutes and 27 seconds, the distance being 75 miles. This is 13 minutes faster than the run of the Mary Powell which has stood for fifteen years.

In Philadelphia shipping notes, issue of May 21, it was stated that the cost of operating the 1,000 candle power lamps of the Automatic Incandescent Light Co. was 6 cents per hour. The sentence should have read 6 cents per night.

Tri-weekly tourist car service by way of the Nickel Plate road. Every comfort of modern train service is provided at very small cost. Berth rates less than half the price of regular Pullman service. Get particulars from nearest agent, or from E. A. Akers, C. P. & T. A., Cleveland, O.

66 June 12

Photographers Attention!

THE MARINE REVIEW is desirous of obtaining at all times interesting photographs of a maritime character. Should an accident occur, should a ship be stranded, should an unusual repair job show up in a ship yard, the MARINE REVIEW will pay substantial sums of money for any such photographs. Many a man in a dry dock, in a ship yard or aboard ship has a camera. Possibly the master or the superintendent has one. If he can accompany the photograph with a written description (merely facts; we'll furnish sentences, spelling and punctuation), so much the better and so much the more profit for him. The REVIEW pays well for good news articles.

Undoubtedly hundreds of extraordinary repair jobs are going on which would interest naval architects and marine engineers, but which are never published because they are known only to those who are working upon them.

This invitation is open to everyone.

United Marine Mfg. & Supply Co.,

MANUFACTURERS OF AND
DEALERS IN

ELECTRICAL MATERIAL

ALBERT C. JAHL, General Manager,
100 William St., New York, U. S. A.

FOR SHIPS AND FORTIFICATIONS.

DISCRIMINATING AGAINST SAIL VESSELS.

At the annual meeting of the Atlantic Carriers' Association held in Boston last week, a resolution was adopted to be presented to congress urging that all the material used in building the Panama canal should be of American origin and should be transported wholly in American vessels. The following officers were re-elected: President, Fields S. Pendleton of New York; vice-president, Frank A. Small of Bath, Me.; treasurer, Eleaser W. Clark of Portland, Me.; secretary and attorney, Edward C. Plummer, of Bath. The board of managers is composed of F. A. Washburn, Thomaston, Me.; James W. Hawley, Bath, Me.; W. A. Anderson, New York; George W. Jones, Baltimore; Peter H. Crowell, Boston; John G. Crowley, Boston; E. H. Weaver, New Haven, and Samuel B. McDonnell, Philadelphia. President Pendleton in his annual address, said:

"A matter of immediate and pressing importance with which we have dealt has been the unfairness shown at coal docks in the great coal ports in compelling sail vessels to give way to steamers in loading coal, in consequence of which sail vessels have lain for weeks at times at coal docks or in the coal ports, eating themselves up with expense in idleness, inadequately recompensed with demurrage dues. We have had frequent conferences with the managers of the coal carrying railroad companies, as a result of which all of the companies are now chartering vessels to load in turn, with one possible exception."

"Although steam vessels secured exemption thirty-two years ago from the compulsory payment of state pilotage fees when engaged in the coastwise trade through the enactment of a law by congress, sail vessels have been compelled to pay these fees during all of the succeeding years, except where they have been voluntarily discontinued in all of the Atlantic coast states north of Virginia by state statute. These state pilotage fees are invariably higher, in most cases double, and in a few cases treble, the amount charged by tugboats for towing vessels into and out of port. The state pilots have maintained at Washington hired attorneys and agents to appear before the committees of congress to oppose and to secure the defeat of all bills looking to the abolition of compulsory pilotage on sail vessels engaged in the coastwise trade."

"In order to counteract the growing strength and insolence of the International Seamen's Union in its attempt to dictate what men and what mates we shall employ on our vessels, and in order to free ourselves from the intolerable dictation of men entirely out of accord with American conditions and customs, we have been compelled to consider the matter of a counter-organization of seamen and officers, in order to free the more respectable men from a coterie of land sharks who are bleeding them of their earnings for their own enrichment, and who threaten to debase and degrade these men to such an extent as to render them objectionable for any employment on American vessels. We are progressing as rapidly as can be expected in the formation of the counter-seamen's organization."

"Just at the close of the prolonged coal miners' strike, Representative McCall of Massachusetts introduced in the house of representatives a joint resolution permitting, for a period of ninety days, foreign steamers to carry coal between American ports, upon the baseless theory that New England was suffering for coal because of a lack of a sufficient number of American vessels to carry it from the coal ports. I am convinced that Representative McCall was victimized, but in just whose interest I am not able definitely to say. This much we all know—that if the McCall resolution had been adopted by congress, as it would have been but for the vigorous interposition of the officers and members of the Atlantic Carriers' Association, and the bombardment of members of congress with telegrams, letters and delegations of protest, a few concerns in New England engaged in the coal business would have soon had a complete monopoly of all the coal to be had, as it was only at their wharves that steamers could be unloaded. The McCall resolution was one of the most dangerous expedients ever resorted to to secure an entering wedge which would have made easier, at another time, the full and free admission of foreign vessels to the privileges of our coastwise trade and the early overthrow of our own vessels."

"For our protection, and in order to prevent delays in port, we must take steps at an early day to secure the repeal of the law requiring the employment of licensed mates on sail vessels over 700 tons. There are so few men to be had that the delay in getting them has often compelled owners to lay their vessels

up or subjected them to annoying delays, in not a few cases the vessels being compelled to proceed upon their voyage without a license, but still with a fully qualified mate, thus protecting the owners' property, but technically violating the laws of the United States.

"Of recent years bills have been pressed upon congress for the payment of subsidies to American vessels engaging in the foreign trade. In the preparation of these bills sail vessels' interests have taken no part. When such a bill came up for passage in the senate last year, the steam vessel interest that had been represented at congressional committee hearings was protected while the other interest so largely represented by the membership of the Atlantic Carriers' Association was sacrificed, the bill as it passed the senate excluding vessels under 1,000 tons from any participation in its benefits. The interest we represent made itself heard and felt before the house merchant marine and fisheries' committee, and had the bill been favorably reported by that committee, as it was not, we were assured that the injustice inflicted upon us in the amendment to the senate bill would have been corrected, and that we would be fairly considered and protected. If a subsidy bill is passed, the classes and types of vessels represented in the Atlantic Carriers' Association must not be discriminated against or overlooked."

TRADE NOTES.

The American Steam Packing Co., 60 Federal street, Boston, has issued a catalogue devoted to steam packings. It is a convenient little catalogue and is carefully indexed notwithstanding its diminutive size. The catalogue may be had for the asking by those interested.

Jenkins Bros. of 71 John street, New York, say in a little preachment on packing that it may be broadly separated into two distinct classes: Rubber, or compounds of rubber, and metal. The preachment deals only with unvulcanized sheet rubber packing, which Jenkins Bros. originated over twenty-five years ago. Then follows the requirements of a good packing. Jenkins '96 packing hardens without becoming brittle and forms a joint as perfect as though ground in and as lasting as the metal which holds it.

The American Spiral Pipe Works, Chicago, has issued a well-bound catalogue descriptive of its products with price list brought up to May 1. The company says that using, as it does, the best steel obtainable it furnishes pipe of a higher bursting pressure for different guages than has heretofore been obtainable. The pipe is now being furnished in larger sizes and heavier guages than has ever been produced heretofore. It is furnished from 3 to 40 in. in diameter. The catalogue includes about twelve pages of valuable tables and information which hydraulic engineers and others will find very convenient.

No one can complain that the color advertisements of the Peerless Rubber Manufacturing Co., No. 16 Warren street, New York, are not sufficiently striking. The latest is so vivid as to arrest attention anywhere. It represents a race track with Rainbow and Peerless neck and neck and Eclipse a close third. The field is either balking or stalled at the hurdles. The plate is apparently executed in the three-color process and is the largest in that process that has ever come to our notice.

The Eastern Elevator Co., Pioneer Steel Elevator Co., and McCarthy Bros. & Co. propose to build at Rice's point, Duluth, three elevators that are to cost about \$75,000 and to have capacity for approximately 3,500,000 bu. of wheat. The construction of these large grain houses is contingent upon certain concessions from the city.

Last week the Harlan & Hollingsworth Co., sent overboard from its Wilmington ship yard the steamer Lord Baltimore for the Ericsson Line, operating between Baltimore and Philadelphia. Her dimensions are: Length over all, 203 ft.; length between perpendiculars, 190 ft.; beam, 24 ft.; draught, 9 ft. Her motive power consists of a four-cylinder triple-expansion engine, 21, 32, 35 and 35 in. cylinder diameters by 24 in. stroke. Four Almy water-tube boilers supply steam.

Contracts for two tugs for the New York, New Haven & Hudson River Ry. have been given to the Bath Iron Works, Bath, Me., at a cost of \$80,000 each. They will be 122 ft. in length.

"Seaboard Steel Castings"**A Guarantee of Quality.**

Open Hearth Steel Castings of the Highest Grade for Locomotive, General Machinery and Shipbuilding Work.

Subject to U. S. Government, Lloyds, Railroad and Other Highest Requirements.

Seaboard Steel Casting Co., Chester, Pa.



NEW METAL CARGO HOISTERS

Wrought Iron Hook and Strap, Galvanized Iron Shells and Sheaves. Sheaves fitted with Genuine Star Metaline Bushings with Metaline Side Bearings.

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SELF-OILING.

These Blocks Save the Rope and Outwear all others.

Send for 1902 Catalogue M. A. R. FREE.

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